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PROOFS AND ILLUSTRATIONS
OF THE
ATTRIBUTES OF GOD,
FROM THE FACTS AND LAWS OF
THE PHYSICAL UNIVERSE:
BEING THE FOUNDATION OF
NATURAL AND REVEALED RELIGION.

BY JOHN MACCULLOCH, M.D.,
F.R.S., F.L.S., F.G.S., &c. &c.

"The invisible things of Him from the creation of the world are clearly seen,
being understood by the things that are made, even his eternal power and
Godhead."—ROMANS, 1. 20.

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ERRATA IN VOLUME THE THIRD.

- Page 17, line 4, *for* "are evils," *read* "is an evil."
,, 22, last line but one, *for* "of," *read* "if."
,, 35, line 19, *for* "underfire," *read* "under fire."
,, 105, " 27, *for* "verua," *read* "verna."
,, 143, " 2, *for* "Tetras," *read* "Tetrao."
,, 282, " 26, *for* "cissiod," *read* "cissoid."
,, 283, " 22, *for* "Nautilus," *read* "Nautilus."
,, 383, " 28, *for* "juniperinous," *read* "juniperinus."
,, 394, " 13, *for* "Medusæ," *read* "Medusa."
,, 428, " 30, *after* "follow," *insert* "the."
,, 546, " 9, *for* "redivivus," *read* "rediviva."
,, 508, " 13, *for* "asymptous," *read* "asymptotes."

DIVISION V.

OR

THE GOODNESS OF THE DEITY,

&c. &c.

VOL. III.

B



PROOFS AND ILLUSTRATIONS

OF

THE ATTRIBUTES OF GOD;

&c. &c.

CHAPTER XL.

ON THE GOODNESS OF THE DEITY. ON FINAL CAUSES.

THE goodness of God is that attribute which the philosophical inquiries of Natural Religion have investigated with least success, and on which it is not possible to write with precision and satisfaction, from observation and reasoning alone. It is here, therefore, above all, that theological writers have recourse to Revelation ; where it is repeatedly declared, as it is also especially shown in the Gospel dispensation. We do not want Scripture, to prove His power or His wisdom, declare it as they may : because we can do this from His works ; as we can, by reasoning, infer His omniscience and omnipresence. But it is necessary to inquire where the difficulty lies.

Our natural proofs of the existence, knowledge, wisdom, and extended presence of the Deity, are such, that metaphysics easily infer their absoluteness or universality ; or, as it is termed, their infinitude. Having shown this formerly, I have also shown that there is a difficulty respecting the equal extent of the attribute of

power. In the case of His goodness, we possess similar evidences, and can also use the same *à priori* reasonings; yet the result is not the same as in the first cases: it is not even so satisfactory as in that of His power. We can prove that He must be good, or beneficent, because He invents or adopts contrivances for the purpose of imparting pure, or superfluous good, being, to His creatures, enjoyment or happiness, independently of utility. We can also argue, as before, that a perfect being, if good at all, must be entirely or perfectly good, yet in His conduct there are facts which are opposed to this wide metaphysical inference: to our imperfect judgment it appears that there are exceptions to His goodness: though we can find none to His other attributes, or none at least which we are not willing to think arising from our own ignorance.

These exceptions are, experienced facts in creation, both physical and moral; producing evil, or unhappiness, and thus the opposite to good: while, having previously inferred that He causes everything, we are compelled to view this conduct as detracting from the absoluteness, or perfection of His goodness. We may believe otherwise indeed: and we do believe thus, through revelation, or by faith: but this is an inference *à priori*, and also on very peculiar grounds, as it is also an inference against facts, and therefore an unphilosophical one; as far at least as our philosophy can now reach. It is indeed easy to say, that the defect is in our own knowledge and judgment, and not in His conduct; as it is also easy to believe this, on the foregoing grounds: but as long as there is evil, to our own experience and reasonings, it is the same thing, as far as the proof of His unlimited goodness which we are here seeking, is concerned. And this has ever been

a difficulty : remaining such, even under revelation, as it has done to the metaphysicians and theologians of all ages and all religions. It is, the existence of physical evil, and still more of moral evil : of wickedness, vice, sin, with the consequent injuries and miseries, opposed to good, or happiness.

If this constitutes the great and everduring difficulty, there is another, of no small magnitude, arising out of the reasonings of metaphysical theology, or natural religion. We are called on to reconcile two qualities, which we are compelled to view as in some opposition to each other : while if the perfection of God, as it is usually argued by these metaphysics, implies perfection in every one of His attributes, or each part of His character and conduct, we are especially unable to reconcile the perfectness of one of these with the same perfectness in the other. I allude to the goodness of God, and to His justice, or to that which has also been termed His purity or holiness. The nature of the first is, to give what is not merited, or more than is deserved : it is pure, unmixed, beneficence. The latter is rigid, inexorable, unalterable : it is to give good and evil according to merit and demerit. Who, by the unassisted arguments of natural religion, has ever surmounted this difficulty, and reconciled these two attributes ?

Hence the connected difficulty of comprehending the nature of "mercy in justice :" this forms a contradiction in terms, if God's justice is perfect, as He is perfect. Should we not do better to admit that we do not understand His justice, than even to measure it by our own definition of this term ? or rather, should not wisdom and piety equally command us to avoid measuring any portion of His character or conduct by the imperfect notions which we derive from our own ? But if this

one of His attributes is especially unintelligible, it requires little discernment to see why it has been so strenuously urged, and by what peculiar opinions, under Christianity. Renouncing these, as I trust we safely may, and if we are also willing to grant that this portion of God's character is beyond our comprehension, we shall lay the easier foundation for proving, very extensively, if not absolutely, that goodness, of which the partial proofs are so abundant. Others must determine as to this very delicate and difficult question: yet the general fact of our ignorance respecting this attribute, seems borne out by our experience. It must have been goodness which gave us good, before merit or trial: it is goodness which gives to wickedness or demerit what it also gives to merit: and when good is even declared to descend indifferently on the just and the unjust, this is a proceeding assuredly not reconcileable to our notions of abstract justice; of that perfect justice which has been presumed and maintained.

I must leave this difficulty to be explained by those who have argued, as metaphysicians, for the perfection of all the attributes of the Deity, as they themselves define those: while it is not within my limits to pursue it on religious grounds. But I must yet notice some circumstances, of minor importance, which interfere with a due contemplation of the goodness of the Deity. These do not indeed nullify the proofs: but they are such as often to make us find some deficiency in those, or to prevent us from receiving them to the conviction of our feelings as well as of our reason.

It is not always very easy for us to view the qualities of gentleness and good-nature, and kindness, or of love and benevolence, in man, as compatible, or combined, with the higher and more energetic character of great power

and wisdom and knowledge ; still less, when to those are added great superiority and distance of rank. If we love goodness, it is also accompanied by a feeling of familiarity, or of equality ; occasionally, even of superiority in ourselves, as if we might despise, or even injure, the beneficent man ; while this actually happens in the cases of practical ingratitude, though the more common, and less offensive feeling is, to consider extreme benevolence as the property of a feeble mind or a weak character. Thence, ever forming our notions of the Deity from ourselves, in spite of all our reasonings to the contrary, it becomes difficult to contemplate His goodness as combined with that power and wisdom, which, in Him, are venerable, awful ; or with that omnipresence and eternity which are fearful subjects of contemplation. It requires deep thought and abstraction to look on the goodness of God as a source of love towards Him, and on Himself as an object of reverence and fear also : it is easier not to think so deeply ; and thence do the proofs of His beneficence seldom operate with sufficient force on our minds.

A similar effect is produced by certain religious systems ; or even, apart from the well-known peculiarities to which I allude, by careless and unjust views of religion, and an evil mode of early education. In the first case, and too often in the latter also, as I remarked in the first chapter, sin, denunciation, vengeance, punishment, are the first, or even the only impressions that are acquired, as they are, by some, indulged : and thus a terrific God becomes that leading idea, scarcely to be eradicated, with which we attempt in vain to associate the notion of goodness or the feeling of love. We may use the phraseology, and even convince ourselves by reflection, that He is good, and to

be loved for His goodness ; but we rarely feel this long, or truly, or deeply and habitually.

Such appear to be the causes which interfere with the proofs of the goodness of the Deity : yet I must still try to show why it ought to exist, *& priori*, and that it actually does so, by facts. The *& priori* argument is of the usual nature : the facts are physical, in conformity to my plan, and they form the present section of this book ; but it is previously necessary to inquire what goodness is, or should be, in the Deity, because there is here a fundamental difficulty, which has produced some metaphysical disputation.

It has been said that goodness in God is different from goodness in man ; and chiefly, for the purpose of obviating the difficulties which I have stated respecting the existence of evil, and also as to the union of this quality with His justice and purity. But the obvious answer seems to be, that we cannot then know what Divine goodness is, or means ; since in nothing can we judge but through our own knowledge of ourselves. And we ought to be right in thus judging ; because He has given us this ground of judgment, and no other : which must be presumed as equivalent to an order so to judge. Hence then are we compelled to estimate the goodness of God by what we call goodness in man : and to those whom Scripture may persuade when reason cannot (as if Scripture were not reason), I may quote the proof from the highest authority in it. " If ye, being evil, give good gifts to your children, how much more shall your Father which is in Heaven give good things to them that ask him." It is true that this was not said to prove the point in question ; but it is plain that He who said it, has defined the goodness of God as I here do, and no otherwise. And if an addi-

tional argument from the same source were needful, it is, that when we are commanded to imitate Him in goodness, that order would be worse than nugatory, if His goodness were not imitable: while if it be so, our own must be of the same kind; however widely differing in degree.

We may therefore conclude, that goodness in God is of the same quality as in man: or, that it implies benevolence with beneficence; the doing of kind actions, or the conferring of benefits; the giving of pleasure, or happiness, without desert or the expectation of a return, from pure will, uninfluenced by aught but the desire of communicating good. And the only very obvious difference, as far as we can perceive, between the quality of His goodness and our own, is its absolute purity and perfection in His case; because, in us, there is a pleasure, and therefore a reward, attached to its exertion.

But granting this, a great difficulty yet remains. The goodness of God is, essentially, obscure to us, because it is but one of many united attributes, and because of our own limited knowledge and discernment. In man, goodness may, and does, produce evil, from the want of knowledge, wisdom, or power. Such goodness as this would not therefore be goodness in Him: even in an abstract and metaphysical view, and apart from any consequences, it would be to make Him unknowing, or unwise, or deficient in power, which cannot be; or, if we contemplate consequences also, the Author of nullity or evil, which is equally inadmissible.

Another difficulty in judging of the goodness of God consists in this. It is a beneficent conduct, not to man only, but to all creatures, throughout the universe, and also, not at one time alone, but for ever. And being guided by wisdom, so as to exclude whatever is im-

proper or inexpedient, in any manner or at any time, as being productive of evil, or opposing good, the entire plan and results become so extensive and complicated as to exceed our comprehension.

But while the necessary limitation of this goodness produces the larger portion of our apparent difficulties, so does it offer the best solution of them. It is necessarily limited as to man, because he is a limited being, and still more so as to other creatures, in proportion to their relative natures. Perfect good could only be given to perfect natures ; for, to be imperfect is to want the means of receiving absolute good, or, is to suffer direct evil. If man, therefore, for example, were rendered competent to this end, he must first rise to the perfection of angels, and lastly to that of God, who alone is perfect, and therefore, alone capable of perfect happiness. Or, if we imagine a scale of beings descending from Him, the next inferior must receive less from Him than He possesses, and thus successively, in proportion to the less perfection of its nature ; whence His goodness is limited in act, without detracting from that goodness which forms one among His attributes. Or, for him to give perfect good to an imperfection appointed by Himself, in His own wisdom, is a self-contradiction, and even a contradiction in terms, or a null conclusion.

Such then appears to be the just metaphysical view of the nature of God's goodness, and such the best solution that can be offered, by this reasoning, of the difficulties which relate to the imperfect experienced goodness beneath His government, under the admission of His absolute goodness. It is plain, therefore, that no deficiency in His acts of goodness will imply the want of it in Him ; because it proceeds in union with a peculiar and a wise design, and because, under that

design, the wished-for good is impossible: impossible to us, unless we could be equal, or more nearly equal, to Him. And the same metaphysical reasonings urge, lastly, that even this imperfectness of good, or this evil, is, in itself, good and right, because the plan must be such, under united wisdom and goodness: but this is a mode of reasoning, I fear, which makes as little impression as generally follows from these verbal inferences.

It seems more satisfactory to state the general inference in a more broad, and therefore in a less repulsive manner: and the question resolves itself into the consequences that ought to follow from united wisdom and goodness. He is perfectly good; but as goodness without wisdom would not always produce good results, and as His wisdom is also perfect, His goodness, in conduct, must be judged of as being compounded of pure benevolence and pure wisdom.

Yet, when metaphysics reason thus, they ever forget that this is precisely what we cannot do, from insufficient wisdom of our own: so that after all these circuitous statements and briefer inferences, though our reasonings are silenced, the want of conviction too often remains. And if I still think that our confidence and belief in God's goodness must be founded on something more than the metaphysical reasonings of natural religion, I may nevertheless add what they have done on this subject. This goodness cannot err from imperfection, because He is perfect; nor can it fail, where there is no inducement to do wrong, or evil. To do good and evil both, is a character of contradictions, or opposition, or it is one of mutability or caprice, or of passion, which cannot be in God: or else it must result from influence,

whereas there can be none to influence ; or from defect of power, whereas His power is absolute:

But after all these usual and sufficiently obvious reasonings, which represent therefore the existence of evil, such as we know and believe it, as the result of a necessity derived from His own appointment in wisdom, and from the relative natures of created beings, the practical question ever recurs. Men will inquire ; and other answers than those will be attempted. And the endless question of the origin, existence, or permission of evil, is assuredly not yet at rest, in spite of the mass of writing, under the highest ability, which has been offered in explanation. The briefest possible sketch of this question is however all that I can attempt, or ought to give, in this place.

It is not within my plan to detail the fanciful or false hypotheses which undertake to account for the existence of evil, on grounds different from that which has been proved, namely, the existence of a sole, wise, powerful and beneficent Creator. It is sufficient to name the system of Manicheism and that of Demonism : the reader can easily find more than is needed, on those two contrivances. They who have sought the solution in a pre-existing state of man, have forgotten, from before Pythagoras down to Holwell, that there could be no punishment, inasmuch as punishment is justice, without consciousness : and they who have attempted an explanation, by supposing the world to be the production of a delegated being, deficient in wisdom and power, have forgotten that this does not remove the essential difficulty, though it may explain the existence of evil ; since He who permits what he might have prevented, is still its cause.

I need make no remark on the system of absolute and uncompromising optimism, or on the consequences deducible from an hypothesis, which even they who have adopted it in words cannot believe. This is the optimism of the fatalists : and if some writers have ridiculed everything under this term, it has been by negligently or purposely overlooking a more reasonable view of this subject, or confounding both under a common name. A rational one concludes that general laws for good, in physics, lead to particular evils, and that moral wrong is an inevitable consequence of that free-will which is, on the whole, good, and necessary. But thus granting the perfect wisdom and goodness of the Deity, it follows that we must limit His power ; unless every instance of such presumed failure were reducible to physical and moral impossibility ; to that self-contradiction or nullity already noticed in the chapter on Power. And this attempt at a solution is therefore imperfect. To say, under this modified optimism, that partial evil is universal good, is to surrender the question, even in terms ; since the evil is thus acknowledged.

It has been said also, in defence or explanation, that the evils of this life will be compensated in another, by overpowering good. To offer this as a solution, is the most manifest of all these oversights. Though there were this future good, the evil has still been suffered : and what if, instead of this good, there be future evil also ? And thus we arrive at that most insuperable of all difficulties, the question of future punishment : while, if it is also to be eternal, it becomes quite fruitless to examine this question any further. But, to avoid this subject, as beyond my bounds, it is also plain

that this hypothesis fails in that case of evil which concerns the inferior animals.

It is not a solution of this difficulty to say, that a good end is gained through an evil ; the illustrative case of a man's limb, amputated to save his life, admits the evil. And though, in any other cases, there is utility, or good, produced by pain, or by diseases, this leaves the question just where it was before. The inquirer, and without impiety, naturally asks, why the all-wise and good and powerful Governor of the world could not gain these good ends in some other manner, and without such evil as no experience or argumentation can prevent him from thinking unnecessary or superfluous.

Some of these hypotheses have proceeded on the general assumption, and in all cases, that every evil is contingent ; yet without venturing to encounter specific facts. It required no small boldness to do this ; as has also been done, for one class of evils at least. I have had occasion to notice this in one of the succeeding chapters (c. 49) so as to supersede any specific remarks in this general one. But it is abundantly plain, that direct physical evil, at least, has been appointed, and even under special preparations for that end. It is in vain to deny the fact. Nor can I see that there is any piety in attempting to maintain the character of the Deity through conscious mis-statements of the truth ; as it is also a worse than hazardous proceeding, when detection must follow. There is moreover but little wisdom in doing this, when the least reflection should satisfy us, that the character thus awkwardly vindicated is one of our own assumption, and that we neither understand His nature, nor the system of His govern-

ment. A sound piety and an informed prudence should equally induce writers to yield the question. And he who says, that under the government of God, evil is not acknowledged, but further, that it is not even declared as being designed, ought not to say, or even insinuate this, while he professes to read and believe the Scriptures. On every ground we are bound to admit the fact of the existence of direct evil, and under the absolute intention of God; be the ulterior and unknown ends what they may.

Thence has the ingenuity, or the joint ingenuity and piety of writers, attempted, not only to show its utility, but to diminish the mass, by appeals to our ignorance and misapprehension. I may notice what is most worthy of being cited in those observations.

Moral evil is the result of man's free-will; and this was as necessary to his probation as it is a contingent necessity on that freedom. All evils also constitute a needful part of his education. Wants, such as hunger for example, are incitements to action, because they are evils; and it is by the consequent exertions that the mind is formed. In this single and simple case, he who was fully fed, without labour or thought, would scarcely rise to the standard of the brute animals. That the evil of pain is a defence against injury, I have noticed at some length in a former and in a future chapter.

But when it is said, in similar defence of evil, that it renders that good a pleasure, by contrast, which would otherwise be unfelt as such, the ingenuity of these reasoners seems to have deserted them; since He who appointed good, could not possibly require such a resource as this. It is a mistaken extenuation also, to say, that the actual evils are often little, and that they

are exaggerated by our self-love, or by our impatience or our own irritable minds. In these cases, that very sensibility, under whatever apparent form, is the evil itself ; as, of this we may fairly complain, if allowed to complain at all : while it is most apparent, that it constitutes a direct and specific provision for evil, if there be anything in man's mind appointed by the Creator ; since it operates extensively, even without an external cause of evil, and moreover, under actual external good. "The wounded spirit" is the true evil of evils : and if this power, especially, is not exerted by Him, for His own wise ends doubtless, in what shall we seek His influence over our minds, or to whom shall we assign this extraordinary power, without adopting a Manichean hypothesis ? And it is not a less oversight, which seeks an extenuation by saying that the good exists, even abundantly, but that we overlook or become insensible to it, from its very frequency and abundance. This, again, is the evil itself, of which we complain. If He is the contriver of all, as we believe, He has so contrived man's mind that he shall not, certainly, derive enjoyment from the invented sources of happiness, and shall not derive it continuously, or long. As far as the senses alone are concerned, the provision for this non-continuance or exhaustibility, seems to be made in the nervous system itself ; though of this we cannot be sure.

It is enough to have thus noticed these oversights ; and it was needful so to do. Many persons feel that there is something wrong in those defences of evil ; while, being unable to analyse them, or to discover exactly where it lies, they reject the whole. Thus separating what is most strikingly erroneous, what little remains will have the more weight.

Ungratified desires are evils, but they are the sources of two goods. They incite to activity; and, if there were no disappointment there would be no hope. And in the latter case, it is remarked, that if the non-attainment of wealth or fame by exertion or merit, are evils, the reverse would cultivate the selfish passions, which are a greater evil; as disappointment is also that discipline which produces virtue, an unquestionable good. Generally also, it may be stated, and as including many practical cases in life, that if evil were not possible, which is to be occasionally existent, man could not be good: a statement which reduces itself under the head of our moral trial. And I may quote the following passage as sufficiently applicable, though written for another purpose:—“ Quid opus esset ipsis etiam virtutibus? nec enim fortitudinis indigeremus, nullo proposito aut labore, aut periculo: nec justitia, cum esset nihil quod appeteretur alieni; nec temperantia, quæ regeret eas quæ nullæ essent libidines: ne prudentia quidem egeremus, nullo dilecto proposito bonorum et malorum.” If it has also been enumerated among the advantages arising from evil, that it affords us an argument for a future state, on the grounds of God’s justice, that is scarcely the fitting place for this argument in favour of immortality: while there are those who have, not very unnaturally, remarked of it that it is not such, unless the future good were secured to all who have suffered evil, though it were through the abuse of their free-will, or their own crimes.

In reality the further pursuit of these special defences does little more than bring us back, by circuitous roads, to the repetition of prior general statements, or to identical propositions, so that I need not proceed, as indeed my plan does not admit of prolonged discussions of this

nature. When Seneca says, “magna accessimus, majora non cessimus,” it is but to remind us, in other words, of what I have already pointed out respecting the Creator’s plan and the gradation of beings. And thus of far more ; while having indicated the principal topics, I can refer, to Balguy, King, and others, those readers who may desire to see these questions discussed at greater length, if with as little satisfaction.

A confession of ignorance must ever become the final resource, even of mere philosophy ; while it is readily made by religion. The ways of God are unsearchable : nor ought we to be surprised that they are so, when we recollect what we are, and who He is. We are attempting to push our investigations of His character and conduct beyond our powers. It is right indeed to search ; else we should know nothing : but it is not less certain that by searching we shall not find out God, while we ought to stop at least when we feel that we have entered on the boundary of clouds and darkness by which He has surrounded Himself. Piety will wait with patience for the solution, but it is the office of another religion than that which philosophy can produce, to inspire that confidence, that entire trust in the goodness of God, which never yet was effected by reasoning.

ON FINAL CAUSES.

I have had occasion, in various parts of this work, to refer to final causes ; nor is it possible to avoid it, in arguing almost any point respecting the Deity, notwithstanding the sceptical objections to the very proposition, and the denial that we have any right, or any means, of inferring His wisdom, or aught else, from what we

suppose to be final causes. A design is nothing, without its correlative, an end : if we can infer no purpose, no end in view, it is in vain to inquire about a contrivance, since contrivances are such, only as far as there are ends in view. Or, otherwise, if there was no end, there was no design ; if no design, no wisdom or intelligence ; and if there be no proofs of intelligence producible, then have we no proof of a God ; since it is on this that the demonstration of His existence rests. Newton speaks the sense of far more ancient and heathen authors, when he says, "Deus sine dominio, providentia, et causis finalibus, nihil aliud est quam fatum et natura."

If I believe that many of those who have urged the argument against final causes, have not seen that this conclusion must needs follow, though we may be surprised that it should have been overlooked by such men as Bacon, and if there are many who would not therefore have used it, there is little doubt that its value to the atheistical reasoning has been fully appreciated by others. But as I have hitherto proceeded as if this objection had never existed, I must now bestow a few words on the question : the more particularly, as it is under the attribute of Beneficence that a writer must inevitably expose himself to the cavils, probably even to the ridicule, of those who may have too often been justified by the failures of piety, real or affected, united to want of information and defective reasoning.

The term itself is so objectionable, that it is surprising to find the most recent writers persevering in its use : particularly when they admit, at the same time, the incorrectness of that phraseology and those statements, in Aristotle, whence we have derived it. The word cause is thus used in different and almost in

opposite senses, when there is no want of adequate, and even of single terms, in our own language. Thence I have dropped it as much as possible, and substituted purpose, or end ; though compelled to adopt it, far too often, from the necessity of keeping in view this dispute, and referring to former writers. I would more gladly have omitted it altogether ; from observing that there is scarcely a term in metaphysics so obscure to general readers, from the familiar meaning of the word cause in its usual sense, and the discordancy of the compound with the usual analogies of language.

The objection to the doctrine of final causes, or to the inferences from them, has been chiefly urged as these were applied to the proof of an intelligent Deity ; and it is, that we cannot judge of the intelligence of the Great Artist, or of any artist, unless we knew the intention, first, and next, the means used for its accomplishment. There is an appearance of logic in this argument ; but it cannot be admitted without an essential reservation. It implies that we cannot know the Deity's intention, because He has not informed us in words : the question is, whether He has not informed us, in the only way in which He informs us of anything in physical nature, by His works. And the argument is therefore defective in the premises. He has informed us by the works themselves : and He has done it in this manner. A thing is accomplished, or a purpose served : it might have been accidental, if we could see no cause, or even if we saw but one ; and it might be accidental also, if it was uncertain, or if some consistent effect did not always follow. But if many things, or causes, are brought to bear on one point, in such a manner, that an effect, an end, follows, and follows consistently, we may then safely infer that it was intended, or that there was

both design and purpose. It is to prove thought, with its results: reasoning on the Deity as we do respecting ourselves, and rightly, because compelled to reason in this manner. It would be equally impossible to prove, in any case, that men acted from a design or intended a purpose, if we are not allowed thus to reason: so that the admission of this celebrated argument against final causes, would equally deprive man of all intellect.

In this argument I have assumed, that many causes, differing in nature, are made to act simultaneously, or in succession, for the production of a certain effect; but the reasoning is similar in those cases where one effect is produced by many independent causes, and where one cause is so contrived and modified as to produce more than one effect; the latter, in particular, comprising what has been termed, "the simplicity" of Creation. In all this, thought or design is equally implied; as the intention is proved by the constancy of the results. And if such a result is not the intended purpose, or the final cause, of the contrivance or efficient cause, it is to assert that a given thing, or event, perpetually following another known thing or event, has no connexion with it; which will scarcely be maintained, even under Hume's views of causation.

I cannot here afford to expand this argument, and to give the illustrations, since they do not admit of sufficient condensation to justify the repetition of facts which have occupied a large portion of this work. But the reader can easily bring them to bear upon it, himself. I may therefore conclude, that we do discover the intentions of the Deity in many parts at least of the creation, discovering them also, more and more, as we become better informed: and therefore that we may safely refer to ends, or final causes, in every case at

least where we can produce the species of evidence in question. Thus I have proceeded respecting the proofs of the intelligence of the Deity ; though I did not examine the general question before, for reasons that will immediately appear.

The objection to the inference from final causes, is, however, divided into two propositions, and I have hitherto examined the first only. The second is, that we do not know the means which the Deity has used to accomplish His intentions. If that was comparatively true when first this objection was promulgated, or if it appeared true to the promulgator, it is the conclusion of him who measures the knowledge of others by his own ignorance. It is a false premise, and demands therefore no other answer : we are very considerably informed respecting the means, and are ever becoming better informed ; whence the entire proposition is nullified.

But it is not uninteresting to note the conduct of scepticism as to this subject, at different periods; since, to observe two parties proving the same fact on two grounds, while each denies the validity of the other, is a sufficient answer to both. The ancient philosophers granted that the design might be traced from the effects or ends, but denied that those could be discovered ; and this was their Atheism under the question of final causes : there was no design, and therefore no designer. Modern ones admitted that ends could be seen, but denied what the ancients granted ; and this was their ground of Atheism. An intelligent Cause cannot be proved, because the major is false, say the one ; because it is the minor that is false, say the other. Atheism then cannot agree with itself : and what of both are true ? I trust that this has been fully shown.

In the present case, as in most others, I have thought it best to pass slightly over, as little fitted for the readers of such a work, the purely metaphysical question which relates to our power of inferring a design from an effect; essentially resembling the equally tormented question of causation. They who desire to inquire of this, may commence with Hume, and terminate with his opponents, Reid, Stewart, and others. Suffice it to say, here, that the fallacy of the former writer, the promulgation of which has nevertheless been useful, by leading to a more rigid examination of metaphysical principles and language, is satisfactorily exposed by the fact, that our inferences, on these, as on some other subjects, are not processes of reasoning, but are instinctive or compulsory, like the axioms of geometry, which cannot be proved, but form the basis of all proof: a part of the constitution of our minds, from which we can no more part than from the minds themselves. But enough of this "*insaniens sapientia*:" I must proceed to that much more delicate and difficult case of final causes, which concerns the attribute under consideration in this Chapter; yet not without some further preliminary remarks on the question at large.

Whenever we attempt to assign an end, as a proof of an attribute, be it of intelligence, for example, a security as to the facts is indispensable; lest a charge of presumption be brought, or lest ridicule be thrown on these inquiries, with an injurious effect. Thus, in reality, has it often proved on this very subject: new knowledge having nullified the conclusions formerly drawn. And that which happens as to intelligence, must occur respecting every other attribute; and also, in proportion as the grounds of judgment derived from a comparison of the end with the presumed design, are

imperfect. Yet we must not forget, that our own ignorance of the plan and the purpose of the Deity, can never be converted into an argument against Him, and therefore, that although we may deserve censure for presumption, He cannot suffer: so that the celebrated remark of Diderot, that the discovery of a single defect in the universe would be a sufficient argument against a Deity, is nothing more than to assert, that man cannot possibly be ignorant, but that God is, or may be, thus deficient in wisdom.

This remark includes, briefly, a limitation of the principle of applying final causes, and a defence against one attack which has been made on it: but as it has been a much tormented question, of which the sound, rather than the sense, may still be in the reader's ears, it will be right to go a little further into it.

I believe I am correct in stating that however the incompetency of our faculties to penetrate the designs of the Deity had been urged before, no very extensive impression was made by this objection, till it was produced by Des Cartes, whose influence in philosophy gave weight, or currency at least, to what was gladly seized on by sceptics; especially when it threw such an obstacle in the way of any attempts to prove the existence of a Deity, from creation. How it has been pursued, and by whom, it is not within my plan to say: but the answer appears so obvious that we may wonder at the prevalence of the objection; unless indeed they who did not desire to find it a solid one, were influenced by that confusion of the ancient philosophy on this subject which I shall immediately notice.

It may be perfectly true, that we cannot see very deeply into God's designs or purposes: and it is most certain that we cannot discover the whole, and never

shall, in this life. But as surely as we see that the eye is an optical instrument capable of collecting light, and that the result is vision, so certainly may we conclude that all its arrangements were made for the purpose of seeing, especially when, without this end or final cause, animals would have been ignorant of the existence of all objects out of contact. Thus to deduce the final cause in this case, cannot therefore incur the charge of Des Cartes, that we intrude ourselves into the privy councils of the Deity.

This remark is, in itself, so childish, that we wonder to find it proceeding from a man of decided talents : though, knowing what authority has ever been to the multitude, and how easily they are led by words, without inquiring of the meaning, we wonder much less at the influence which it acquired. But the fact is, dropping this silly phraseology, that it not only is our duty and our business to inquire into God's government and conduct, but that we cannot avoid it if we would. There is a law of our mind, or an instinct, visible even in childhood, which compels us, notably, to inquire into human plans and intentions, and on which much of our knowledge is founded. It is the same principle which induces or forces us to inquire similarly of the Deity ; while being implanted by Himself, it would be a sufficient argument in favour of these investigations, though they were purely voluntary. We ought, even thus also, to conclude that this pursuit was useful, though we could not prove it such ; while we have every evidence of its utility that *a priori* reasoning joined to experience can furnish.

If I have here referred to authority, rarely doing this on similar questions, for reasons elsewhere given, I must make a remark which seems both deserved and

required, from the uses, or abuses, of this influence. In spite of their vanity, men have an instinctive propensity to be led, a tendency to follow, like herds of cattle, the cry of a leader. They were thus led or driven by Aristotle, for centuries : never once inquiring of the facts, but of what the leader thought of them. No one then examined or reasoned ; while the habit strengthened the instinct, so that when this leader was deposed, the herd was as ready to follow the next who assumed the command. Des Cartes thus became the master, as Aristotle had been ; and if he did not govern so long, or so extensively,—if he is, now, rather questioned than followed, why do not the men who do this, ask themselves to what purpose it is to build books in debating the opinions of others, especially where those are worthless ? And authority on that which all can equally examine, is tyranny, as the submission to it implies a discreditable ignorance and indolence : while when once antiquated, it is a buried shadow. But it is easier to censure wrong than to establish right ; as it is also on nothings that men can write most interminably ; independently of the miserable pleasure arising from controversy and acrimony.

The fact to which I just alluded, as having thrown discredit on the doctrines of final causes, was that awkward philosophy of the Peripatetic school, which tended to confound actual causes with final ones, or ends, while the disgrace continued attached to the term final cause, long after this mode of philosophizing had fallen into oblivion ; however difficult it may be to believe that any person exerting thought, could have ever confounded the efficient cause of a thing with its purpose. But as this can never happen again, any discredit arising from this cause should cease : while

the abandonment of the term for the better ones here suggested, would consign it to oblivion for ever; rendering superfluous the caution to "keep these two modes of philosophizing distinct." And if Bacon has been quoted as an authority against the research into final causes, by opponents who, having no definite ideas of their own on this subject, or moved by anti-religious feelings and wishes, have tried to shelter themselves under his name, they have not seen that whatever blame may attach to him for carelessness, his censure refers to that abuse of those investigations which would put a stop to the investigation of physical and efficient, or real causes; as the miserable state of philosophy in his day will also especially justify that censure.

To take no further notice, therefore, of the evil use made of this presumed authority on the question under review, I may for the present concede, that the inquiries into final causes do not belong to philosophical or scientific investigation, in the usual sense of that term; yet that cannot interfere with their propriety under the views of metaphysics and natural theology. To decline asking respecting them, is to refuse inquiring whether the Deity has any purpose in view, in creation itself: and to abandon this, is not only to renounce all natural religion, but, in reality, to end in an Atheism: as Atheism has, surely, well known. It is but through those inquiries that we arrive at the knowledge of His wisdom and goodness: if we can, without this, infer His mere existence, we cannot prove that this existence is an intelligent one; as also, in renouncing final causes, we deny His government: so that nothing remains but the neutral Deity of the Peripatetics; if even aught remains but fate, nature, nothing. It is not right or charitable to say, that the modern opponents of final causes, such

as La Place, carry their conclusions to this extent ; but it seems certain that their reasonings will force them to it, as it must be presumed that they have not examined the consequences. A Being, if there is to be any Supreme Being, utterly neutral and negligent, would indeed have no ends at all in view now, or is not the actual governor of the world : but even then, if He once appointed "general laws," as such theists admit; He must have had ends, or final causes in view ; since a law without a purpose, is a contradiction, almost in terms. If further, we admit that He is wise and good, those ends must be good and wise ones : so that in reality the whole question of natural religion becomes identified with the inquiry into final causes : and those are especially inseparable, if we are to rest the proofs of the attributes, and, above all, of the moral attributes of God, on *a posteriori* evidence, instead of metaphysical inferences ; since we then judge of those by the effects.

So far, therefore, from being justly restrained or limited in our inquiries after final causes, or the purposes of the Deity, it is equally our business and our duty to investigate them as they concern His attributes in any manner. And not less, assuredly, as they relate to His goodness, being the subject of this division ; on which I am bound to offer some special remarks, and the more so, as the propriety and validity of the inquiry have been more questioned in this case than in any other.

We have seen that the wide existence of evil has rendered the absolute goodness of the Deity one of the disputable or difficult propositions under metaphysics ; so that the evidences of actual goodness become particularly acceptable, while they must necessarily be sought in final causes, or in good purposes following

distinct designs. These proofs, if duly investigated and truly inferred, establish the fact of this goodness, as far as they reach ; while it is but by those investigations, condemned as they may have been, that we can hope to extend them, and thus receive a more convincing sense of the beneficence of God. And be they deficient as they may, at present, they still suffice to prove that this world is a general system of beneficence, however admitting evil.

It is of such proofs, or attempts at proof, that the chapters under this division consist ; being statements of good, or happiness, enjoyed by man chiefly, under distinct designs or contrivances for that specific end, and no other ; and being thus an inquiry into final causes. That this requires caution as well as knowledge, is plain : but the guide and check consist simply in this ; that we do not attempt to infer anything of this nature, which is inconsistent with the other established attributes of God, or the general analogy of His creation or government. I may therefore express some surprise at the rigidity of certain recent writers on this subject, particularly as they have constructed their own moral systems on this very ground, the character of God, and the useful ends purposed by the faculties and passions of man. But though we were mistaken, is there any harm in being grateful for an imagined good, or a presumed good intention ? This is but an error of judgment, after all : and it is surely better to be grateful for what was not meant as good, than ungrateful, though it were but through error, for what was. We have reasons for believing, which I need not repeat, that the goodness of God is much greater than we can prove it to be ; so that we are in little danger of error from attempting to prove too much.

This belief, or conviction, will therefore be an aid, if not an absolute guide, through such investigations : it is that basis, which if it does not lead us through all, will still tend to disclose valuable truths ; while, to abandon it, or to choose some fancied guide, is to end in error and doubt. The great, the ultimate generalization, is a Creator, wise, governing, and good ; and even philosophy has no right to reject the last inference, where its proofs fail or become obscure ; because this is to profess the contradiction, of entire knowledge and confessed ignorance. The great moral end of Creation was to give good, and the great moral pursuit of man is to seek and believe it, that he may imitate his Creator : while this may be attained through that modesty which will admit its own ignorance, and that piety which believes in His perfections. But our pride and vanity are such, that we would rather be accused of moral delinquency than folly : and this is the true source of the ridicule cast on those who have erred in assigning false or fanciful ends, for final causes, especially in the present case. Yet excess of piety is no fault : and should it lead to wrong conclusions in philosophy, there is no fear that these will not be corrected.

To return now to the general question of final causes, I may recommence by pointing out an obvious evil which has arisen from the restrictions attempted by the antagonists to those inquiries ; be those the consequence of misplaced caution, or of ignorance as to the object, and utility, and nature, and limitations of those researches, or of systems or opinions respecting the Creator, to which I need not now do more than allude.

Whatever the pleasures arising from mere intellectual exertion and successful investigation may be, (and they are here fully acknowledged,) they are highly

enhanced by the moral views which arise from considering the uses of creation, the application of its contrivances to the purposes of sentient beings, and, above all, to those of man, in all his complicated relations to that creation and to its Author. But even independently of this, such views demand and comprise that very exertion of ingenuity or intellect, which has been affectedly declared, to be the only pleasure worthy of a wise man. And therefore, to omit these considerations, in physical inquiries, or to omit attaching them to such discoveries, is, at the very least, to rob philosophy of a large portion of its pleasures; were there no other evil consequences arising from these ill-considered and untenable dogmas.

But I must now go further, and deny the proposition I formerly granted, namely, that the inquiries into final causes are entirely independent of scientific investigation, and that they ought therefore to be separated, or renounced, inasmuch as they are of a purely moral or metaphysical nature. To trace a system and a design, is not only an object of interest in mere science, but it is one of the duties and proceedings of philosophical investigation; being, in reality, science itself, because it is generalization. Thought, foresight, contrivance, or provisions, expedients, and corrections, are objects of inquiry in science, and so are their produce, in the several means, or causes, under all their modes, through which an effect is produced; while, of all this, there could be nothing to be inquired of, unless there were an effect, or an end. This end or purpose, is the link, or basis of generalization, which binds all together: but it is, further, the guide towards the whole inquiry, or even its very foundation: as it is also the very matter in dispute, or the final cause. It is but through the final cause,

as I have already observed, that there are means, or efficient causes ; and it is but because there are causes or contrivances, that there is ingenuity or thought, as those also imply a thinker or a contriver. All these things, philosophy investigates, as a matter of course, in the works of man ; and wherefore are they to be rejected because the contrivances and the purposes were those of the Deity ?

Yet is this, He, the very reason why these researches were condemned by those to whom I formerly alluded ; while others followed possibly, and even probably, without perceiving either the moral consequences or the philosophical folly of such restrictions. And I doubt not that this has been among the causes of that carelessness or oblivion respecting the Deity, which has so notedly pervaded philosophy, and been so conspicuous among its cultivators, even where those would have been shocked at such a previous suggestion : while, that it has confirmed the habit of doubting where the mind was already in that condition, is not less probable, though it may never have been, in itself, the cause of Atheism, as it has much more probably been its consequence.

But if this is an inquiry that I desire to avoid, especially as it concerns individual philosophers, I must still be allowed to remark, of a great name already noticed, that when La Place seems to sneer at those who consider that the moon was created to enlighten the earth, while he speaks of a plan for that purpose which could have left no doubt, it is a remark which we may class with that of Diderot, already quoted. And I should be unjust to my subject and my readers equally, not to point out his analogous aberrations of mind on the subject of "probabilities ;" since a

name of such deserved weight is too apt to possess a proportionally pernicious influence. But beyond this, I desire to avoid all inferences: while much more willing to think, that the cause may be sought in that contraction of the mind on all subjects of moral speculation and reflection, which is produced by the habit of intense meditation on physical subjects alone, more especially when of an abstract and mathematical nature.

But, though there were no philosophical utility, or necessity, or interest and pleasure, in the investigation of final causes, I have already shown that we cannot avoid it, since it is an instinct of our very nature. This is satisfactorily proved by the conduct of practical men, in all the sciences, who had never heard of this metaphysical question; and it will be expedient to note a few facts in proof of it.

This has been remarked especially, of anatomists, ever seeking the uses of specific organs, and guided in their researches by those; but as the illustrations from this science are inconvenient, I will take one from botany, peculiarly eligible from its familiarity, and from the equally familiar design which is thus proved by the discovery of the end or purpose. In addition to the usual and well-known parts of a flower, there is sometimes a superfluous one, and so differing in different flowers, as often to bear no kind of resemblance. The question at once arises, what is its purpose? and this is strictly, a question of ends or final causes. If none were to be found, we should remain in darkness, even as to the fabric of its analogies: but if in any number of cases it is observed to contain honey, which is a final cause, we have the clue to the investigation of other nectaries; and the general design thus discovered,

renders the order of the parts in all such peculiar flowers, intelligible and consistent.

So far, moreover, is philosophy from rejecting links or modes of generalization, that it is, as I have said, one of its chief offices to seek for them ; and wherefore then should it reject a moral link, when that is attainable ? It is often the only one that we can discover . and if therefore the link of ends or uses is not to be, and actually is not rejected, though the cause is unknown or is not considered, why must this be done because the Deity is concerned, or becomes the object of ultimate reference, the presumed cause ? And further, must we reject it, because, having at last yielded this point, we refer it, not to the Deity vaguely or generally, but to some portion of His admitted character ? If not, and the reasons why we should are not apparent, then may we safely make His beneficence, or goodness, that link ; as I have done in this disputed case now before us. There is good existing, or enjoyment produced : and it breaks no law of philosophical analysis, to trace this upwards. There are designs, or combinations of causes, which it follows, and from which it appears to arise ; and why were they not arranged for the purpose of producing it ? In the works of man, we should decide that they were : and when we trace the hand of the man, we say that he intended to produce this good, and did produce it in this manner. We cannot indeed reach and see the hand of the Deity, in the case of creation : but it can be inferred after we are stopped in tracing the design ; and thus, with equal safety, may His intention be inferred.

Two simple illustrations from facts formerly stated

may serve to render this reasoning more satisfactory. The replenishing of the earth by plants, was an act of beneficence in the ends, as of design in the means. In that design, as formerly detailed, the means involve the raising of mountains, the chemistry by which they are destroyed, and far more, for which I may refer to that and other chapters. And there is no physical bond uniting these numerous and discordant processes ; yet when viewed under a moral aspect, or with reference to the end, or final cause, the whole forms a system of machinery so beautiful, that he must be careless indeed who does not consider it with admiration. But if we exclude that end, all this beauty disappears : philosophy can scarcely give a reason for much of what it still sees ; nay, there is much that it does not see, discovering it merely through the end or final cause, beneficence.

In a different department of science, geology, we find the most incongruous causes, or means, in action : mechanical powers, chemistry, underfire, water, and air, with vegetable and animal powers and agencies, all employed, often in entire independence of each other, and without any obvious common bearing or purpose. As long as that science had not generalized them, no such connection and no design could be discovered, or even conjectured : but assuming the principle of beneficence, as I have here done, and the practical final cause to be the enlargement of the habitable earth, I have now here traced a beautiful system of machinery, of which, before this, geology knew nothing.

I know not how far the division of labour between the pursuits of moral and physical science may have led to the evils in question, but it is a pernicious one in every sense. The exclusive attachment of modern philosophers to one or the other of these branches of

knowledge, is evidently injurious to both, and in more ways than one. But on the subject immediately before us, independently of what I have already said, the metaphysical theologian has reasoned imperfectly or incorrectly, from the want of facts, or from mistaking them ; as the merely physical philosopher, sometimes from deficiency of metaphysical knowledge or of correct logical reasoning, at others by separating God from His own works, has ended in arrogant, or false, or mischievous conclusions, which a sounder philosophy would have taught him to avoid.

I may end with a remark which ought to have the more weight, from including the coinciding opinions of many philosophers of the highest reputation ; while perhaps never better expressed than by one whom I avoid naming, from the prejudices which that name is still apt to excite. It is, " that as true philosophy tends to promote piety, so a generous and manly piety is reciprocally subservient to the purposes of true philosophy ; for, while we keep in view the great final cause of all the parts and laws of nature, we have a clue by which to trace the efficient cause."

CHAPTER XLI.

ON THE FEEDING OF ANIMALS, AND THE REPLENISHMENT OF THE EARTH BY THEM.

If there are few who ever contemplate the Deity in His works, or even meditate in the slenderest degree on the wonderful creation by which they are surrounded, the first impulse nevertheless, should such thoughts occur, is to turn to the wide universe of orbs, as here also it is most common to rest. Nor is this unnatural. The appearances are obvious and striking: we see incomprehensible power displayed, and are generally satisfied with reflecting on that attribute alone, yet even then forgetting in how many other ways it is demonstrated. If we should know enough of the celestial mechanism to infer His wisdom also, here our conclusions as to Him end: though limited indeed are the proofs of that which it affords, compared to what the universe displays to him whose mind and studies enable him to scan all creation.

But we discover here no proofs of God's beneficence; and, did we believe some philosophers, no traces of His government or providence. It is through the living creation, that physical science infers the former, at least most directly. The sun is, to us, the most splendid effect of His power: but did not life exist to enjoy and benefit, that glorious body would be, except to Him who created it, nothing. To what purpose this diversified earth, if it were not inhabited? The Creator

alone would be sensible of its absence, were it to vanish from the universe. But, not only was the solid sphere of the earth itself created for this purpose, when the globe of the moon was appointed for the same end; that it might administer to life. The light of the sun was ordained for life, since a dark sun would have equally preserved the earth in its orbit. But the immensity of that central sphere exists for no other end, than to support, as on a foundation, the earth bearing life, with all the planets which were created with it, that they also might be filled with life. To what other end the boundless universe of orbs? were it not for this, they need not have existed: they are filled with life and happiness; this is the consummation of the bountiful Creator's great design. Great indeed, when we contemplate even our own earth and sun: far greater, when we view the planets which partake with us of its light: and exceeding all imagination, when we turn to the wide universe, and see that all this preparation, all this immensity of extent, magnitude, and numbers, of contrivance and power, was for no purpose but to give life and the means of life, to make a place for its existence, and afford the habitations for a perpetuity to terminate only with the universe itself. And to what other purpose the waters, the atmosphere, the diversity and contrivance of the earth's surface, the invention and the variety displayed in its materials; to what other, that marvellous Spirit, Chemistry, through which life exists so as to perform its functions and enjoy the allotted good? All was created and appointed for the enjoyment of those to whom the goodness of God has allotted such a portion of happiness as He thought fit, from His own willing bounty.

If life has been imparted to two forms of being, so

are we sure that the power and the means of enjoyment have been given to animals. I trust hereafter to prove that this is also true of plants: but I must commence with the former, since no proof is here required. And as the quantity of imparted happiness is to be measured by the numbers enjoying, the purpose of the present chapter is to convey some ideas of the fulness of the earth, and of the means used for its replenishment. The conclusion follows of course: the numbers demonstrate the extent of the Divine goodness. I need only remark, for the reader's convenience, that as the moral purposes here in view have never permitted any connected history of the animal creation, more than of aught else, he can turn to the other chapters necessary for the illustration of the present.

Though all life depends on the supply of food, and, that under superfluous fecundity, this supply determines the replenishment, there is an essential difference in this, as it relates to animals and to vegetables. The food of the latter is everywhere, and it is brought to them: that of the former is under a much more complex system, and they must seek it, because it is not always nor everywhere present. For whatever else the power of locomotion has been conferred, it is for this principally; as it is under a scale which, commencing in nothing among the rooted animals, extends to the rapid fishes and the migrating birds. Thus every atom of the earth's surface may be covered by plants, unless we could conceive air to be absent as well as water; and, under a general view, it is so covered, while crowded even to reduplication, where the latter abounds, since there is no check then but the want of room. Such a mode of replenishment as this, could not, it is plain, exist in animals: if

the fixed *Lepas* crowds the submarine surface as the plants do the terrestrial one, it is because its food is brought to its mouth; and it is only under the water that this could have been done.

It may perhaps be asked, if the supply of food thus determines the quantity of animal life, why is the earth not fuller, if, to fill it was the Creator's intention: it seems to teem with unconsumed vegetable food. It is much fuller than it appears to be on a careless and superficial view. If it were not, all the superabundant fecundity would grow up into active life: the bird, the locust, and more, are obliged to migrate: the spot which they leave is full of all those kinds at least. That which may appear a superfluity in the vegetables, is required to perpetuate their races, and it is needed for many other uses, easily appreciated: the desired replenishment would not only destroy these, but animal life itself, by cutting off the sources of future supply. Abundance was intended, not merely that all should be sure of their enjoyment, but as a provision against casualties, or other necessary actions belonging to the total system. The defects arising from winter, or scarcities, are corrected by occasional excess: the supply must be viewed as an average one, and such must be the replenishment: we have abundant experience of the excesses of population in animals, and of the consequent evils; very little, of such defects, as we also know how soon and easily these are corrected. Thus, occasional changes in the earth's surface, or changes in the balances of animals, produce occasional excesses of food; but in this also, the duration of that superfluity is brief. And there is no excess of vegetable food where a system has been perfected, as it is, under man's care. It may seem so to a careless eye; but we know that if the

surface is not covered with vegetation, it is because that is wanted for other uses, that if all which is produced is not consumed as food, it is also because of other wants supplied by it, that the reason which never fails, man's interest, keeps the animal population as high as it can be, consistently with the Creator's prime intention, and that if we demanded what seems most easy, a greater replenishment in the minuter animals, the effect would be to injure or diminish, or finally to destroy, all others, and thus to defeat the Deity's plan. I need not here inquire of the same suggestion as it concerns the feeding of animals through animal food: the answers are easily supplied; as the system of prey is also examined in another place. The present ones are brief; but they are easily extended, under a very little reflection: while the conclusion is, that as it was the Creator's intention to fill the earth with numbers, for the purpose of multiplying happiness, so is it replenished with animals, as far as it could be under a regulated design, and without the production of miracles, or perpetual deviations from that design.

The regulation of plants, according to situation and climate, forms the chief part of the inquiry relating to their numbers: here, it is of comparatively trivial moment. The animal races may be broadly divided between the earth and the waters; since the aerial creation belongs to the former. But in comparing the mass of aquatic vegetables with that of aquatic animals, we find an immense superiority in favour of the latter; sufficient, or more than sufficient, to balance the great excess which the terrestrial plants seem to possess over the animal inhabitants of the dry land. That the animal lives of the earth, indeed, far exceed the vegetable ones, will fully appear in the course of this inquiry,

They have been constructed very widely on a far more minute plan ; so that we might even place many thousand animals within the space occupied by the minutest known vegetable. And the reasons seem sufficiently obvious. Plants much smaller than the least ones known, could not have found place or protection in the general crowd of vegetation : it is only in a few chosen and rare places that the smallest ones exist at present. The tender organizations of the minutest animals are protected by the surrounding water ; and, to have constructed similar plants, they must have floated at liberty, since the soils beneath could give them no protection, for the same reasons. From whatever necessity or reason, this has been made an exception : it occurs but in a very few, and the reasons are not difficult to assign. Being also designed, partly at least, for food to animals, an extreme minuteness would have defeated the intention. With respect to the comparatively small numbers of aquatic plants, I may also add, that as light is necessary to their existence, they are limited to those depths in the waters at which it can reach them. Locomotive animals can seek it, as far as it is necessary for them.

In these two great divisions of animals, the terrestrial and the aquatic, the structures differ, in conformity to the intended habitation : and the systems of feeding are regulated accordingly. Under the latter, we know little of the causes which determine them to situation or climate, and to the last, especially. In the ocean, the effect of climate is comparatively trifling : we must suppose that some vegetable food determines situation, thus fixing the places of certain animals, and, in succession, of those which prey on them : while it is also possible that the heat of the superficial water and the

shallow seas in the hotter climates, may determine the production of the smaller marine animals, as it does of the terrestrial insects, with a corresponding consequence. On the land, it is the assigned place of the vegetable food, which chiefly, or essentially, determines that of the animal; while I need not here repeat what is examined in the chapter on their limitations, hereafter (c. 53).

But the cause of limitation and order is also the source of life. On the provision of food which the Creator has made for animals, depends the replenishment of the earth; for, without that, fecundity would have been in vain. Yet we forget to note this perpetual miracle, the feeding of those myriads which crowd the world, because it is before us every day. It had not, however, escaped those ancient philosophers who, if possessed of less information than ourselves, were far more ready, at all times, to look up to the Great Cause of all. If I do not quote the sacred writers, he must be very ignorant of them whose mind does not immediately recall the passages to which I here allude.

It requires considerable familiarity with natural history, and perhaps a still wider stretch of imagination, to cast over creation that rapid and comprehensive glance which would display this perpetual, this hourly miracle, in all its force. I cannot here replace the want of these: while assuredly, amid all which creation displays, of contrivance, resource, power, there is nothing more calculated to astonish us than this fact, simple as it may appear to the superficial; the unceasing and unfailing supply of food to the uncountable myriads, of all forms, sizes, and propensities, which crowd this world of land and water. And it is God who spreads this table daily, hourly, for every one of these multiformous beings; of which, out of many hundred thousand

forms, all differing, all feeding in different ways, not a single species only, but hundreds, thousands, can be named, each exceeding in its numbers, at any moment, all the men who have lived in the earth since the creation. Most truly do they all wait on Him, and receive their meat in due season.

In what manner can he who has never yet considered, be taught to contemplate this subject? Will he reflect on the labours by which he must feed himself, or those through which others feed him: the series of persons, and instruments, and toils which must precede, ere he can see on his table even a fragment of bread? Will he consider the labour and thought necessary to provide nourishment for the few animals which he has associated to himself? Can he imagine himself the keeper of even a hundred of those which he imprisons for his amusement: will he stretch his imagination still further, and replace those hundreds by thousands, by tens of thousands, and then conceive himself taxed to feed them by his own contrivances? Should he conceive all this, and thousands of millions of times more than this, he will not then have approximated in the minutest degree; no, not by myriads of millions more, to the numbers that are fed every day, every hour, and so fed that not one perishes for want: fed, under kinds which science cannot count, feeding in different ways, on different objects, all ever craving yet never wanting, and as they are fed to-day, having been fed from the beginning of the world, to be fed as long as it shall last. Does he but count the gnats which darken the air of the summer evening,—God feeds them all as He feeds the lion and the elephant. Or will he attempt to number the multitudes of the ocean, swarming in every form of diversity and size, from the Whale to

that atom which the microscope barely discovers ? Differ as they may, widely as they wander, various as are their desires, it is still He who prepares their table in the wilderness of the waters, that not one shall perish for lack of food.

In this we see, the beneficence at least, of the Creator of all these races, though we should see no more : nor is it a small, or a careless, or a casual effort of goodness, when so much forethought has been exercised and such arrangements made. I have said it elsewhere : to eat, is the proper business, and nearly the sole happiness, of the inferior animals : all else is comparatively trivial, or else supplementary. To be born, to eat, to die, to revive in a posterity, such is the course of animal life : but, of all these, to eat is the centre and the purpose, for this is the designed happiness. For this end was the machinery created, and for this was life imparted : to live, and to eat, are one. It is the principle on which this multifarious creation is based ; on whatever other the inhabitants of other planets may have been constituted. Man is the exception. Excluding him, no form of present life need have been, but for this : it is the reason for life, and the final cause of life. It is a simple principle : even thus slightly viewed, it will surprise him who never before considered the plan of Creation. It will surprise him far more, when he reflects on the operose system, on the complicated means and the intricacy of contrivance, the thought, the wisdom, the power, applied to the attainment of a purpose as simple as it is single. For this alone, (always excluding man,) does all else exist ; every thing that is, is but a preparation for this end. Materials, elements, chemistry, light, heat, mechanism, multiplicity of organic forms, the earth itself, the very sun, are, that animals may eat.

It is indeed a system to excite surprise: but it would be even more surprising, could we believe that the Creator did not Himself feed His creation, did not contrive for that food which forms the end of His entire plan. To analyze the contrivance is indeed beyond our reach. It depends not on chemical laws which we can investigate: it cannot be measured and resolved by geometry. We cannot disentangle that which involves so vast a mass, and such overwhelming numbers of forms, such an universe of lives, independent in themselves, yet mutually connected and dependent, under the control of a superior force; a multitude so enormous of powers and desires, of instincts that we see but in part, and of inclinations that escape us. It is a problem too complicated for human ingenuity to investigate, executed as it is: the very possibility of its execution could not have been conceived: yet it has been executed by Almighty wisdom and power, and the whole complex system proceeds for ever, with simplicity and regularity equal to its perfection.

Is it indeed not a work of design, of design the most comprehensive, of forethought the most minute, of wisdom beyond the possibility of estimation, and of power which knows no bounds? No,—has it been said by that philosophy, which ever hating to believe in a Governor of the universe, has referred the whole of this marvellous system to chance. The mathematical doctrine of probabilities, even in the able hands which I need not now name, would labour long to demonstrate the possibility of such a system, on its own grounds: working out such an end, so regularly, so securely, through such a period of time, and under so many changes in the earth and its inhabitants, without error as without failure. But if we cannot analyze

the whole, we know enough to oppose this worse than ignorant hypothesis, can see enough of design to leave no doubts respecting the entire one, as I have already unavoidably said in the 23rd chapter. The desires of animals prove, that to every one there is an allotted food : they are inclusive and exclusive : it is one of the adaptations which pervades all nature. The Lion does not eat grass, nor does the Ox prey as the Tiger. It is said that variety exists, has happened, and that various kinds have chosen what pleased them. The insect races disprove this. There is a single food for a single insect : no other one desires that : it desires no other, refuses all else. If this is not design, where shall we seek it ? The philosopher himself feeds twenty animals, with different kinds of food, feels his difficulties, and prides himself on his knowledge : yet he refuses to acknowledge the contrivance and providence of Him who feeds millions for ever, with ten thousand sorts of food ; ever supplying their wants, ever consulting their tastes, without error and without failure. How could He act otherwise, when this was His prime and ultimate intention, the object of all that He has effected in the universe ?

But systems for the Creator and His creation are for ever formed by those who know neither Him nor His works : it is but another mode of that scholastic philosophy, which, knowing nothing, determined on every thing. With no ulterior intentions, this is pardonable ignorance. But let it learn at least, before it teaches. And let him also who takes no note of creation, learn to see. It is because of the beauty and regularity of this system, that his want of thought discovers neither. Its very perfection is the source of his neglect or denial. In his philosophy, that which never fails, is a

necessity ; and that philosophy forgets how wisdom and contrivance are proved. He acknowledges, that order, regularity, and certainty, are proofs of design and wisdom in the works of man ; and will not see them in those of God.

Under this system of food has the earth been filled with the animal forms by which it is inhabited. To many, vegetables alone have been appointed ; while there are entire tribes, such as the more minute and more imperfect marine animals, living entirely on animal food. In some, there is the inclination with the power, to feed in both modes : but whether there are animals, which can, like vegetables, feed upon sub-elementary matter, on air and water, has not, as I formerly remarked, been determined. Whatever might be inferred from the analogy of plants, it is hitherto not probable, because the minutest Infusoria require at least solutions of compound matter for their existence, and almost all the minute and the least perfect animals of the ocean, possess organs of some kind for apprehension. From the plant to the vegetable-eating animal, and back again to the plant, the circle is simple : while it is an essential part of the whole system of feeding, that it consists in a perpetual circulation, more or less complex : though the final term of the utmost complication of circles, is, as far as we yet know, to return every thing to the plant, that it may recommence as the initiator of food. The intermediate agents between the two systems of life, are the earth, or the water, and the atmosphere ; that wonderful laboratory, which I formerly described, in which every thing appears to be lost, receiving but to return again, as the earth does, if more visibly. The carcass which has been dissipated by the winds or burnt on the funeral pile, will as surely

return to revive in future plants and future food; to give existence to future animals, and to perform the same round for ever, as that which has been buried in the ground, or the perished straw which forms the treasure of the agriculturist.

The circles become complicated under the system of animal food, since many changes from animal to animal may take place before the completion of the great round. Chemically viewed indeed, the circle is one: it is only prolonged in one portion. But, physically, it is a short subsidiary circle, where the sparrow which has devoured a caterpillar dies: it is a longer one, should that become the prey of a hawk. It is still longer, or rather there is a more complicated succession of subsidiary circles, should a fox devour the hawk, and a lion the fox; while this last animal might leave its own carcass to the larva of a fly, as, still further, there might be an intermediate vulture or hyena, before the larva, or a vulture between the hyena and the larva; while the larva again might become the food of a bird, of the sparrow once more, to travel the same round, or many other rounds, before these smaller circles fell into the great one and terminated in the vegetable. Thus complicated is the system of feeding through animal food, as here chiefly is intricacy of plan displayed. Hence also may the great circle be prolonged beyond imagination; as it is probably very far prolonged in the ocean: while it would, or might be, a purely animal circle, could we prove that any of its inhabitants were empowered to feed, like plants, on air and water. If that which has been supposed were ascertained, namely, that in the earliest states of this globe there was no other than a marine animal life, such a circle must have existed;

as we should then see the unavoidable necessity of a carnivorous system, or the system of prey.

Having been compelled to separate this portion of the total system of food, under other moral views, I must here refer to it, that the present inquiry may be completed: the only further remark necessary in this place, being, that under the complicated system of mutual destruction and feeding, and our ignorance of the food of the entire animal creation, we cannot discover the whole of the Creator's plan in the replenishment of the earth. We cannot know what was necessary, either in forms or numbers, for maintaining even this part of the system, because we are ignorant of the action and reaction of the several portions on each other; and though believing that the display of variety was intended, among other things, much of this diversity may have been appointed to ensure the existence and happiness of the whole, and thus to fill the earth with life.

And it is filled with animal life; under forms also, to which the researches of natural history are making daily additions, and which they may never exhaust. Of all this, however, the multitude knows nothing, scarcely even believing, when informed, amid what a vast mass of life it exists. It sees the quadrupeds and birds around it; the man of towns scarcely sees even those: the insects, the minuter and less familiar tribes, are viewed by the former as accidents, superfluities, annoyances: the latter may almost be pardoned for thinking that the world was made for him alone. He who is teased by the gnats of a summer evening, does not know, or forgets, that one hour of that evening has brought into existence, within the compass of his own river banks, more lives than the race of man in Britain; and when

he complains of the green water at his door, he does not dream that it contains more animals enjoying existence, than the whole world of men at that moment. How then should he know that a beneficent Creator intended all this, as He created it all and feeds it all, that all might enjoy ; as He does, that He might multiply happiness in the earth. The naturalist alone knows it well : and if he can indeed contemplate all this without reflections like these, he has not learned from his studies what they ought to have taught him.

It is not easy to convey any idea of this fulness of creation to those who do not know the objects of natural history, not knowing even its terms, while the knowledge of those is indeed but that of catalogues : but it is not the only occasion on which a writer must regret that he is teaching the blind to see and the deaf to hear, offering proofs which cannot be understood, detailing facts to be passed over like the fictions of a fairy tale, and attempting to display a Creator whose works all have agreed to neglect. I cannot therefore follow the arrangements of this science, but must take a broader and more popular view of this subject : while the uninformed reader may perhaps derive some aid from the former chapter on the variety of creation (c. 25).

Considering this great population under convenient classes, the quadrupeds form the most obvious division. Renouncing an accuracy which is here unnecessary, the number of species may be taken at about twelve hundred : a small one, compared to the birds which partake the earth with them, and are fed, jointly with them, through animal and vegetable life. Among these, I need scarcely say that the Elephant is the largest, as the smallest must be sought in the numerous species of Mice. Of the proportion of individuals under each kind, it is

impossible to suggest an estimate, in this, as in all other cases : but the following general remarks will give some aid to conjecture, while they form a part of the present subject.

In any given species, the population must be connected with the fecundity : and this, as far as we can yet discover, seems to bear a proportion to the certainty and abundance of food, in the first place, and next, to their utility, under the system of prey, in forming the food of other animals. To this I may add the length of life : the shorter lives, under a broad view, being allotted to the more productive and numerous species. While the herbivorous kinds moreover are far more abundant than the carnivorous, so is the population of individual species under the latter inferior, taking the whole together ; although there are animals of equal fecundity under both divisions, as in the Dog and the Wolf, for example, compared to the Rabbit and the Mouse. It is a general rule also, that the larger species are less numerous in population than the smaller ones, both in the herbivorous and the carnivorous tribes. There are millions of Hares to one Elephant, and thousands of Wolves and Jackals for every Lion.

These are the chief facts, under which conjectures of the individual populations might be formed : but they are not all, as some of those also demand extension and remark. It is indeed impossible to discover all the necessary facts for this purpose, as, of the actual details, we cannot but be ignorant. The scientific researches of natural history give no aid, and little is known of the civil history of animals, in any department : while the perpetual changes in the balances of creation, and above all, the interference of man, render all universal conclusions uncertain, and often, practically untrue.

These last causes, influencing such populations, might be deemed accidents, had I not elsewhere shown that they were portions of the total design. Such indeed are the whole, as certainly as the system of feeding forms a regulated plan; while indeed they are but parts of this wide and complicated machinery. This will appear more clearly, from the subsequent remarks on feeding, under this practical case, and from those on the sizes of these animals: as also from that rule, or check, arising from localization and limitation, which I did not enumerate with the others. No one indeed can doubt that the several allotments of fecundity, in degrees so very different, being purely arbitrary, have a reference to this great plan; difficult as we may find it to explain all their bearings.

If the Sheep and the Antelope are more abundant than the Wolf and the Lion, though less productive, the cause lies in the greater facility of feeding: if they abound far more than the Elephant, under no great difference of fecundity, it is because the latter requires more food, though that food is similar. The Rabbit abounds under two causes, an extraordinary fecundity and an abundance of food: and its numbers also point it out as a designed food for the carnivorous species. The carnivorous animals, however productive, are checked in numbers, by the defences, concealment, and escape of their prey: and were it not for this they would produce their own checks, or ultimate extermination, by destroying their own sources of supply: whence also we perceive that the defences of animals are not less useful to their enemies than to themselves; every thing which we can see equally evincing the perfection of the design. Yet though the herbivorous species should increase, the carnivorous ones may diminish; as happens under

the dominion of man, producing unusual numbers of the former, protecting them better, and becoming the enemy of their enemies. It would be easy to extend these remarks ; but I need not : while every piece of knowledge we possess, and each new one that we acquire, add to the proofs of design and wisdom.

The causes of limitation examined in a future chapter (c. 53), tend also to regulate the populations of species, whether they consist in climate, in situation, or in food. Whether the Lion can exist in another climate or not, it will not at least seek that which offends its feelings : the Rhinoceros is limited in numbers, partly at least, because the places it loves are few, as the Hippopotamus is by the extent of the rivers of a hot climate, the Ant-bear by its food, and the Chamois by climate, situation, and food united. The reverse universality of the Rat, not less than the extent of its population, is partly measured by its food, and partly by an entire absence of attachment, either to place or climate, with, possibly, an instinct of migration superadded. If the Ichneumon has really no other food than the eggs of the Crocodile, the boundaries of its population are rigidly marked : but though tied down to place and climate, its actual check is limitation of food.

It were easy to extend this also ; but it suffices that the principle is illustrated. Still, the supply of food will be found the most general measure for the populations of species : it is one of the simplest questions in political economy ; and as these supplies vacillate, for any kind, so do the numbers vary, yet under averages regulated by average supplies, while we cannot doubt that the allotted fecundity for each, was chiefly determined for such averages ; as its superabundance was, to furnish the means of a perpetual regulation, under oc-

casional exceedings in the quantity of food : whether such food was merely superfluous, or injurious through its destructive powers.

With respect to the sizes of quadrupeds, as concerned with their populations and with the regulation of those, it is easy to see why there should not have been a much larger one than the Elephant, nor a much smaller than the Sorex minutus, which weighs but a drachm. Anatomy and mechanics prove, that with the existing materials, the limit of magnitude indeed has been nearly attained in the former ; while the peculiarities of its construction show that it required the very hand which produced it, to solve the problem as it is. At the other extreme, it is easy to see that a much smaller animal would form a structure too feeble, from the slenderness of the bones alone, while it would also have been deficient in power for such a habitation as the earth ; a thing to be the prey of an insect, or to have been destroyed by every casualty. Accordingly, when the animal structure is reduced below this, we find the Humming-bird, formed to move through the air, and enabled to escape the injuries that would crush a terrestrial animal ; or the insect, with similar powers, and much greater strength to resist.

This reason therefore is the sufficient one for the boundary of magnitude in quadrupeds at the lower end of the scale ; but the reason assigned for that at the other extremity is not equally valid, as it does not appear to be the true one. The Creator was not tied down to definite strength in the bony material, nor to a maximum power in the muscular fibre, because He has far exceeded the assumed limits in the construction of insects. The obvious reason is, the quantity of food required for large magnitudes : the elephant con-

sumes the food of a thousand small animals, perhaps of many thousand insects : and thus, had even the present large species abounded more, the smaller must have been correspondently restricted, with a consequent diminution of the number of lives and the sum of enjoyment. We shall immediately see that the great excess of species in the birds, as compared to the quadrupeds, depends on the smaller scale used in their construction ; a scale, equally admissible and necessary. But there is a further reason for this restriction, in the necessity of concealment, as a mode of defence : though operating chiefly, as man, the universal ruler, extends himself. Over the Lion and the Elk alike, as examples of the two divisions under food, he at length acquires the power which exterminates them, and all the larger races : but the millions of Mice which ravage his fields are as much beyond his reach as the insect creation. Everywhere, his power is proportioned to magnitudes in animals ; vanishing entirely as they descend in bulk and increase in numbers ; as those also are one.

If such are the reasons why the very large animals are limited in species, as their wants limit them in numbers, the Creator has also wisely provided for this, by restricting their fecundity. In the next stage below, there is a reason for the large size pervading many herbivorous species, in the views of Providence respecting their uses to man. The Camel and the Horse are his needful servants, and ought not to have been smaller. But all through that prevailing average which ranges from the Sheep down to the Hare, the scales seem to have been determined, partly by the supply of food, and partly under an allotment of sufficient power to attain it, through force, or under the needful locomotion ; as defence and escape also de-

manded the latter. And the same sizes, for the latter reason, were required in the carnivorous tribes, substituting attack for defence; that the Tiger might be balanced against the Buffalo, and the Wolf against the Sheep. Species of much inferior size to the Hare, must have been wanting in locomotive power, except under special constructions; while those exist: and thus, as we descend in the scale, we find that the system of concealment becomes the necessary mode of defence; while a nocturnal, instead of a diurnal life, has been appointed, apparently for the same reasons; the aid to defence in this case, as it is to attack in the predatory kinds.

These are but general views and selected examples: it is not here that I could investigate so wide and complicated a plan as that of the animal creation, while this division also forms the smallest portion of it. For the same reason, I cannot note the exceptions; while, as such, they merely prove that we do not understand the whole of the Creator's design. But is it surprising that we cannot comprehend His moral and political plans, the most intricate and obscure portions of His government, when we are ignorant, and likely ever to remain ignorant, of a far simpler branch of natural history, where every thing is open to our sight; the mechanical plan under which He has constructed this world of animals?

The enormous populations under the smaller species of quadrupeds, as in the migrating Rat of the north, the similar animal of the Russian steppes, or the Suslik, and our own Shrew mice, which sometimes cause the surface to resemble a living mass, will now assist in showing why the feathered races so far exceed the former in numbers. The species here, as far as they

are known, may be taken as nearly five thousand; being more than four times the number of those in the quadrupeds: while the total population probably exceeds in a much greater ratio. The preceding remarks have shown why smaller sizes were admissible in this tribe; while the extreme in the scale of magnitude, where the whole range of that scale is far less than in the quadrupeds, is necessarily fixed at a much lower point, as it is regulated by a different principle. There is a weight which no power of wing could support, under the existing allotment of force to the muscles of birds, greatly superior in strength as these are to those of quadrupeds: and the Creator has chosen to pass that limit in the Ostrich race, thus showing where it lay. The Condor and the Lammergeyer are the heaviest birds that fly: but if we pass a few more of the predatory and aquatic ones, forming neither a large number of species nor a great population, we soon arrive at an average size inferior to the rabbit in weight, and rapidly descending to the scales of the rat, the mouse, and the shrew; as the Humming-bird, much less than the smallest of the latter, terminates this series. And taking the entire mass of species, the scale of the rat is a much more predominant one than that next above it; as the sizes of the mouse and the shrew seem to form the largest population in the feathered world.

Hence there is a greater mass of food, as compared with the consumers: the population is larger, because these are smaller than in the quadrupeds. The grain required for a horse will feed a hundred sparrows. But though the seeds of plants form a large portion of the vegetable food of birds, it is far from the whole. Some are herbivorous, others feed on the tender shoots of shrubs, or on buds, and unexpanded flowers, as the

Swan, the Grouse, and the Black-cock do ; hundreds more live on fruits ; and the Humming-bird, destined to what no quadruped could attain, is the rival of the Bee.

If the carnivorous birds are perhaps not less numerous than the former, while a great many consume both kinds of food, the predatory ones which devour their companions of the air are few in kind, and very restricted in population, as their fecundity is also low. The apparent reason is, that this species of food was made very difficult of attainment : the law which permits it is almost an exception, when compared with the numbers in this division, and with the same law in the quadrupeds. Among the whole of the strictly carnivorous ones, the much greater number is directed to find its food in dead carcasses, and in the fishes. But the latter mode of feeding is far predominant ; while it is rare, in comparison, among the quadrupeds, as the reasons will shortly appear. The largest store, however, of animal food for the birds is provided in the innumerable insect races ; in themselves and their larvæ, including with those the terrestrial worms. It is a system of prey ; nor can we doubt the intention, when we contemplate these enormous numbers : while this peculiar supply aids in explaining the superiority of the feathered population above that of the quadrupeds. It is but little effect on the latter which is produced by the Ant-eaters, or the Mole.

We shall now see more clearly how the superiority both in species and in population, among the birds, is produced by their peculiar powers of locomotion, as secondary to the provided supply of food. This is of yet more importance than their low scale of bulk ; while it is necessary even for that, so entangled are all

these plans. To this also a peculiar construction aids ; in the form of the bills especially, and in the acuteness of vision ; though I need not dwell on this part of the provision, since it is easily extracted from a former chapter (c. 9), where these contrivances in anatomy are examined.

The power of flying appears, on a superficial view, to be a mere indulgence to a favoured part of creation ; but it forms the very means of the existence of these races ; while we could not replace them by any form of quadruped, or of any other animal existing ; of any animal indeed of a different construction and powers. He who says that the food could not but have existed, must admit that this tribe of animals was invented on purpose to consume it : the argument against chance is perhaps more striking than that which I derived formerly from the inclinations of animals : while the peculiar constructions already alluded to, so remarkable in this class, afford another, to add superfluity to proof. It is this power of locomotion which enables them to procure food inaccessible to any purely terrestrial animal : it would still exist, but it could not be consumed ; and the extent of the living creation would be restricted by the whole amount of this great population.

Through this power it is that they can obtain, from plants and trees, those minute seeds which no other form of animal could reach, even did it desire such food ; ranging also from place to place, without labour, in search of what would not repay the toils of any other, and feeding on the minute waste which is scattered far and wide. And the perfection of the other adaptations is not less admirable. The acuteness of their sight, and the peculiar power of suddenly changing the focus of the eye, enable them to perceive the most minute

objects, at great distances, under sudden changes of distance, and while in rapid motion ; the forms of their bills enable them to pick up these objects in all situations ; they can seek and pursue them amid recesses inaccessible to other animals, and their small bulk renders a single, and an almost invisible seed, acceptable to them. Thus do they feed plentifully, where we cannot even conjecture what their food is : and hence must we admire that wisdom, which, in scattering, and apparently wasting, the superabundant seeds of millions of plants, has created animals to feed on them, as they were doubtless also created for those animals. In the fruits, it is true, the Monkey, the Squirrel, the Lemur, and more, contest with them by climbing, as do the larger Bats by the same power of flying ; but whatever added population this may give to the mass of quadrupeds, a single species of Parrot may outnumber the whole race, as the Pigeon of America exceeds perhaps, in its own numbers, the united multitude of quadrupeds that feed on grain.

In the carnivorous birds, alluding now to insect food, it is evident, that with the slender exceptions just noticed, where the Ant-eaters are among those anomalies which, under our imperfect knowledge, we find all through creation, no other powers or constructions could have profited by the prepared food. The same locomotion, with all else which I have described, was indispensable, and for the same reasons ; while in these cases, we find the usual powers increased, and the constructions multiplied, under an enhancement of adaptations, in the rapid and angular flight of the Swallow, and in the Woodpecker, the Duck, the Woodcock, and far more. No other forms of mouth could gain possession of this food, no other motion but that of the Bat

could contest a fly with the swallow: and if the snout of the Mole has been prolonged to rival the bill of a bird, and the other quadruped has been furnished with wings, they will teach us respecting the design in the former case, could we overlook it. As the fishes are concerned, if the Seals, the Beaver, and the Otter, are destined to this food, their powers of submarine swimming are restricted, and so is their range; while their bulk also limits their population, since they require much subsistence. But the sea birds can range wherever they please; they can reside on the wave, pursue beneath it more rapidly, and see their prey from aloft; while their smaller sizes give them a wider command of their sustenance. To the Gannet, ranging hundreds of miles in a day, food can never be wanting: the divers are fishes in power, and the Albatross is almost a tenant of the ocean sky, as the Petrel is of the wave below..

But the gift of flight possesses a far wider operation under the same design, the consumption of food and the multiplication of animals. This is the power of migration, with the attached instinct to migrate, and the yet mysterious provision through which a knowledge of the fitting time and the right direction is given. The facts are familiar: while the Duck and the Swallow may suffice to represent large classes of insect eaters and universal feeders, though the migrators among the former are much more numerous than is supposed by all but naturalists. The former visit us in winter, and the latter in summer; but the motive is the same with all. Each is in pursuit of food: but there is an essential difference between the two migrations, the departure, and the return; as here also are the design and the power of the Creator especially marked. The duck is driven from the north by the failure or inacces-

sibility of its food, and it returns with the northern summer: the swallow flies from us to Egypt, for the same reason. Both are under the same force, the stimulus of want, in this case. But it is another one that brings back the latter to our shores, and sends the duck to the northern ocean. In neither case has the food failed: Egypt could still maintain its swallows; and the duck, sometimes disobeying the general command, remains to breed with us. But that command has been issued, that the food of the northern summers should not be unconsumed while a double demand was made on that in the south, thus interfering with the wants and claims of others: as, in addition, we may believe that part of the intention was to relieve such northern climes from an injurious superabundance of insects. This is a beautiful piece of political machinery; as it seems to be an irresistible force controlling the animal's free will: while that force probably consists in an instinct of locality, the desire of the progeny to build in the place where it was born. The great bearing of this system, however, is on the purpose of replenishment. The neglected summer food would have maintained no population: the fixed consumer could have had no longer an existence than its food; or none but insects would have been created for such places, as they also might not have been able to consume the food in question. But the power of migration furnishes the means of using it wherever it is produced, and whenever it is ready: and thus even Egypt maintains a larger population, by the aid of Britain, than it could have supported alone, though it might have provided for the swallow all the year round.

Of minor migrations I need not say much. By those of the Rice-bird, the Pigeon, the Parrot, and more;

in other countries, as, in our own, by the less remarkable changes of place among Rooks, Starlings, Larks, and others, the same general purpose is effected. It is thus that the Deity compels His creatures to multiply up to the level of the subsistence which He has provided; as thus also He commands, that what He has thought fit to produce shall not be wasted. The fragments of His great feast are not to be lost. Such are the true theory and purpose of migrations.

The Amphibia of natural history, including the Tortoise, Lizard, Frog, and Serpent, as leading divisions, afford little ground for remark under the question of replenishment: the species, the populations, and the place they occupy among the total mass are, all, of little note. The number of species is very imperfectly determined: but it is believed that it does not amount to five hundred. In some, as in the frogs and the tortoises, the populations seem occasionally considerable where there are room and food, with freedom from enemies and molestation. They may possibly fill blanks in creation which would otherwise be unpeopled; but as far as we yet see, all the food which they consume might have been divided among the birds, the quadrupeds, and the fishes; as the places which they occupy are also frequented by these. But there is so much more in creation of which we are ignorant, that we need not grieve to pass this division in such a manner; while they serve at least to augment the variety with which the earth is filled.

The difficulties increase with the ocean and its tenants. It is not very long since we knew of less than seven hundred fishes; we now know six thousand, and have doubtless to learn of many more. We are equally at a loss to form conjectures of the individual population as of the total, except in a few such cases as

the Cod and the Herring ; guided partly by experience of numbers, and partly by that production of eggs which bespeaks a high fecundity. Were this latter indeed a safe ground of judgment, we should forget all the population which has already passed in review : the geometric multiplication of the cod alone, though its life were but annual, would render the ocean almost a solid mass of life in a few years. But we know that this fecundity is, here, above all, intended for the feeding of other kinds, and how little of the progeny arrives at maturity. Though the sea appears also to teem with fishes, we do not know the geographical extent of this population : finding reasons however to believe, that some of these crowds are but colonies attached to particular places, as the cod notably is, and that the general multitudes do not range far from the shores ; as it is also apparent that the deep ocean is very thinly inhabited, and by a very few species. Vegetable food limits many to the shores and shallow seas ; and where vegetables find their boundary, that of the fixed and the indolent inferior animals is not far off, since most of those require light, in the same manner ; as that of the species which find food or refuge in them, is coincident. Thus does a great mass of animal food, in an involved succession, become confined to narrow limits near the sea shores, in the shell fishes, the crustaceous animals, the swimming radiated tribes, the fixed ones, and the proper worms, under endless sizes and forms ; whence a succession of followers among the fishes, independently of those which feed directly on the marine vegetables. And as one great series of food at least commences near the shores, this should be the centre of a population which ought not therefore to range very far, as the facts seem to prove :

while it must be recollect, that their migratory and rapid movements, united to the gregarious habits of many, confer on them a kind of ubiquity which easily induces us to overrate the population.

Under this question of food and place however, as determining the boundaries of a population, which may thus lead to deceptive estimates, I must remark that the deep ocean seems to produce many of the inferior and smaller animals ; as I formerly noticed in speaking of the light of the sea, and of the Shrimps, Beroes, and Clios, which form the food of the Whale. Yet these do not determine a large population for that ocean ; since, while the oceanic fishes are not abundant, as they could not have escaped notice if they were, the destination of the whale as to its food, excludes the possibility of a high population in an animal thus feeding.

I must also add, that the determination of population in the fishes, to the shores, is produced by the necessity of depositing their eggs within the reach of light; which seems the true motive under an instinct, rather than the nature of the submarine soils. Thus it is, that under the irregularity of seasons in which they produce, the vicinity of the land seems for ever peopled with them ; while in the summer, as the more general time of laying, it is peculiarly crowded. And hence also are other crowds determined to the same places, from the period of hatching, onwards ; since the young form a principal part of the general supply of food. And these are the subjects to be taken into consideration, in attempting to conjecture the extent of the replenishment of the ocean by fishes ; their proportion to that enormous space which is destined for their habitation. Were it everywhere what it is near the land, it would indeed be a population to make us forget all

others ; yet we cannot doubt that it is still very great, even in this department of aquatic animals : while we shall shortly see what it is in the inferior marine tribes. And this is all too that I can say on the subject of food in this department ; since it is that one in which our ignorance is extreme, otherwise than as we know that nearly the whole is a wide system of prey.

Here however is the first point in the progress of this inquiry, at which we begin to discover numbers, and thus to become tangibly sensible of the quantity of life existing in the earth. The preceding investigations, important and necessary as they were respecting the general subject, could determine nothing on this point ; since in no case could we obtain a sight of the animals in great numbers, if I except the single instance of the migrating Pigeons of America. I have therefore left all estimates and conjectures to the reader ; confining myself to the general facts and principles under which the Creator's plan has been wrought out. Hereafter, and commencing at this point, the actual replenishment, or fulness of the earth, will become the leading object of notice : and I may therefore name the most striking of the facts through which we become actually acquainted with numbers in the fishes. This is found in the gregarious ones under the smaller dimensions, and most conspicuously in a single genus, Clupea. In the Herring, the Sprat, the Pilchard, the Sardine, and the Anchovy, the numbers which can be counted, because they are taken, amount to an annual sum of involved millions, to which no conception can reach though it were represented in figures ; while we know that this can be but the least part of the crowds whence these have been separated by our nets.

With respect to magnitudes, and the proportions of

the species under them in the fishes, there seems reason to believe that the same general rule holds as in the terrestrial animals. Yet the greatest magnitude in the ocean far exceeds the highest on the land : the structure was here practicable, for obvious reasons ; and it has been appointed accordingly. Nevertheless the very largest fishes, comprising the whales, are not numerous : as the most bulky of these could indeed scarcely have been, under the singularly disproportioned size of the animals appointed for their food ; contradicting all expectation, and, as we should deem, all expediency and propriety : since it is the more general rule in creation, that some near proportion should hold between the life to be sacrificed and that to be supported. The multitudinous species commence at a far lower part of the scale. With exception of the Tunny and the Sturgeons chiefly, the higher populations seem to begin with the size of the Cod and the Salmon, as they appear to extend down to the Anchovy ; though the greatest multitudes are found between the dimensions of this fish and the Mackerel. Such at least seem to be the rules in our own seas ; and respecting others, natural history at present gives us no information. The reasons are doubtless the same which were already assigned.

How far the migrations of fishes relate to the same purpose which this system does in the birds, it is difficult to decide, for want of information. It appears to be limited to the gregarious tribes, as in those : but this may be only the consequence of its greater conspicuity, while the same mistake has existed from the same cause, in the flying creation. It ought to be very general, if perhaps within small limits, from the necessity of laying the eggs near the land ; as the Salmon

offers a striking instance under this head. But it seems also undeniable, that the Herring, and other fishes, migrate for the purpose of feeding on the Medusæ and other marine animals wherever they may chance to be produced; in which case the same general principle has been applied here as in that of the birds, and for the same purpose. This indeed we seem entitled to conclude, from that analogy, and from the obvious and great uses served: since, to act thus, belongs to that consistency which we discover all through creation. But there is no proof of any very distant and systematic migrations among the fishes, similar to that of the swallow, unless the pursuit of the Herring by the piked Whale be of this nature. That the herring itself thus migrates, and under a regular and systematic course, to our shores, I have, in another work, shown to be a pure romance.

If I have alluded to the noted and almost incredible fecundity found among the fishes, I must here add, that it does not commence beyond the point which I have assigned, as the limit of the populous species. As in the birds of prey, the large and rapacious ones are narrowly restricted on this point; as is familiar in the Whale and the Shark tribes. But wherever it has been allotted, it is enormous; since if all do not equal the Cod in this respect, there are many that do; as there are scarcely any, of which the progeny would admit of being reckoned by numbers so low as thousands. This leaves the insects, and I believe nearly all the remaining marine tribes excepting the crustaceous ones, immeasurably behind. The queen Bee may lay twenty thousand eggs, as that seems to be among the most prolific of the insects: yet she is the sole mother among thousands, while every female fish is such, to the enormous

extent just stated. Whether we can discover it or not, this marine population ought to be very great; though we must always consider the fishes as performing a double office, far more extensively than probably any other animals in creation, excepting their inferior companions of the ocean: executing the functions of a plant, we may almost say, by producing a posterity for no other end than to maintain the lives destined to this food.

In the Insect world, we do not discover any utility in the very great number of created species; though seeing why there should be a large population, under such a diminution of magnitudes amid superabundant food. If there has been any reason beyond the display of invention, for this incredible number of forms, it does not depend on a continuous series of feeding, as is partly the case at least, in the marine tribes; since few insects prey on their own race, and as, to their great enemies the birds, all forms are indifferent. It is the same as to the vegetable food. Though a single plant should universally have been allotted to a single insect, which cannot be, since the latter far exceed the former in numbers, this would not account for the variety; since the *Aphis* of the rose, and the *Coccus* of the oak, might equally have fed on every plant, under their existing powers. Their limitations consist in their tastes; and those have been commanded. The honey eaters might have been one, instead of a hundred: and thus, far more widely. But there is every reason to believe that a vast number of insects do not eat; thus departing from the general principle with which I commenced; their only office, as we can discover, being to produce the larva as the great consumer of food. Thus obscure is the system of political economy contrived for

the insect world, under the great article of food, and thus hopeless, therefore, are all attempts to understand it.

The species enormously exceed in number all that have yet been enumerated, as they far surpass those in variety of construction. If the estimate, as given by different naturalists, varies greatly, the lowest numbers one hundred thousand ascertained species, while it has been supposed that this is not more than a third part of the whole. But this number does not represent the whole of the animals in this division : and even if we must not double it, yet we do not know how far we can venture, because unable to reckon up those, of which the larva is not a separate and a previous animal. Still, that number cannot be great : so that, allowing for unknown species, even at a very low estimate, we may venture to take nearly four hundred thousand distinct animals in the division of insects. The naturalists seem to have forgotten this in their estimates ; from collecting the flying animal alone, and neglecting its second mother ; the true viviparous mother of the previous egg, though sexless and unpaired : believing indeed, with the vulgar, that one animal was transformed into another. And this is the more extensively feeding portion of the whole ; to the larvæ ought our inquiries to be principally directed, in examining the food of insects ; for if there be a regulated economical system, it has been devised chiefly for them.

But taking the whole together, since our ignorance allows us to do no better at present, while the food must here also influence the population, it is, very widely, far more in excess than in any of the preceding cases ; if there are instances in which it becomes defective, or fails altogether. In a superficial view, seeing the

abundance and the variety of the food, and contemplating the sizes of these animals, we might suppose there was no limit to their increase ; but we have proof to the contrary, in the caterpillars, and in the Locust notoriously ; while even the Bee, under cultivation, is sometimes overtaken by famine. The variety of food appointed for these races is also much greater than that allotted to any other division ; including every vegetable and animal substance on which animals at large feed, with many kinds which none seem to touch. Thus do they devour their own races, beneath the waters as on the land, the dead carcass of every kind, the living one which cannot defend itself, the hair and the feathers, dead or alive, rejected and disorganized animal matter, even when in solution, and the blood of life ; even establishing themselves within and without the living animal, so as to heap existence upon existence. In the vegetables everything is equally their food : all plants, and every part of every plant ; from the seed to the flower, the fruit, the leaf, the bark, the wood, and the circulated and secreted juices : equally feeding on what is dissolved and disorganized, and even nourished by wood which, from its age and dryness, would seem to contain no possible nutriment.

But there is one important difference in this case, comparing the insects to the tribes already passed in review ; though in these there are a few exceptions. In the colder climates at least, the vegetable food is only a summer provision ; so that the existences are regulated by season or temperature. Most of the winged insects die ; as the terms of their lives have also been appointed to meet this event : though in very many, the term of life is far shorter, and independent either of the failure of food or of diminished tempera-

ture ; being sometimes limited to a single day, or even to less than an entire one. And from what I have said of the separate existence, identity, or consciousness, of the larva, this is truly the sum of youth and age, the total of life ; so that the metaphysician is still at liberty to speculate respecting their notions of time. The larvæ become hybernant in the pupa state, and this also is the case with a few insects whose lives are prolonged to a second year. And in these instances, as in others, it is evident that temperature itself is a necessity : since many, whose food never fails, become dormant, or die, when it falls below a certain point ; even should that be previous to their natural terms of life. And further, our house-flies, as more might possibly do, hybernat under the presence of food and of an artificial high temperature ; as if for this there were some special law.

Having shown that smaller sizes of birds and quadrupeds could not have existed, under the actual structures, though there is no limit downwards to the marine animals, from the protection which the water affords against injury or destruction, I must, in noting the sizes of insects, allude at least to the contrivances through which the extremes of minuteness, as indeed the whole of this small scale of magnitudes, have been attained. The aquatic larvæ are protected from injury, even as the marine animals are, also by the power of burrowing and attachment : while the terrestrial ones similarly fix themselves, or are concealed in cavities, even in their food, made by the act of eating, or wrought out by themselves or their parents in various substances, or constructed architecturally, or discovered and occupied ; all under a great variety, for which natural history must be consulted. And thus also a strong and sometimes otherwise guarded integument, with the

want of projecting limbs, becomes a further security against any injury short of destruction. In the flying insect, the invention which placed the muscles within and the bone without, is perfect for the purpose of security as well as strength; and thus does the reduction of size become almost unlimited, even on the land. The minute beetle found in pinks, and the red spider of the vine and the strawberry, show the degree of minuteness which has thus been attained.

As far as we can discover among objects so difficult of complete access, the same general rule as to magnitudes holds in this case as in all the preceding: or the large species are not so numerous as those in lower portions of the scale; while, for the most part, they are less populous. The Cockchafer and the Locust, however, are exceptions, among many more. But where, throughout so enormous a number of species, science does not know the civil and economical history of a few hundreds, it is fruitless to attempt any inquiries on the subject: since the single instances of great population in the Termites, the Ants, the various Gnats, the Aphis, the Coccus, and more, can establish nothing towards a general rule. That the carnivorous species preying on insects are slenderly populous, seems to be true in these animals as in the birds.

Of their fecundity, we are, equally, so partially informed, that scarcely any general conclusions can be drawn. It is of little aid for such a purpose, to know of the extraordinary rapidity of production in the Aphis, or of the unseen and unexpected disclosures of crowds in many other species, which overwhelm us in an instant. In most of these cases, we can see that there are numbers producing numbers: and there is no instance of any fecundity approaching in the remotest

degree to that of the fishes, even under the frequent and repeated productions of the aphides. It is here also easy to ascertain the number of eggs, which is seldom great, as, in the predatory ones, it is very limited: while the extreme numbers, already noticed, seem to belong to the Bees, with the Termites and Ants, under a very peculiar political contrivance.

But in whatever way the crowds of insects which seem to fill the world are determined, I must try to convey some idea of their numbers, in a few known species at least, as I did in the case of the fishes; since this is the immediate fact which concerns the question of the replenishment of the earth. The clouds of Gnats which often form a dense fog on the banks of a river during a summer evening, are the produce of a single species, most commonly; while they are but the successors of an equal population of sub-aquatic worms. He who has witnessed the mass and density of such swarms, can see that they amount to numbers which no arithmetic could compute. I have measured them by miles. I have measured by yards a dense column of flies, flowing like a steady and rapid river for a whole day, and how much longer I know not: and when each yard might well have contained a million, it is for the reader to imagine their possible numbers. But the familiar records of natural history abound in all this, and in examples which leave them far behind. A few square miles of Lapland or of the banks of the Don, will contain, in one day, more lives of this kind than all the great terrestrial races united; while these too are renewed many times in each summer; in some tribes, daily. The mind becomes confused in endeavouring to think of such crowds of beings; and in recollecting also, that each is a distinct consciousness,

with all the self-will, the desires, and the happiness, permitted to its kind ; constituting an individuality of mind, and a conviction of existence, of liberty, of space, and time, and power, and enjoyment, and choice, as perfect as that of man himself : a thinking being, because it is a living one.

Though I need not here quote much from accessible works, I may note the multitudes of locusts which they have recorded ; extending five hundred miles in India, and so dense that the sun cast no shadow ; and, in Germany, darkening it so that objects could not be distinguished at the distance of a few yards. Thus have ants appeared in the West Indian islands, flowing like the torrent of a wasting river, and destroying everything in their course. But it is best to refer to such books, for this and more on the same subject.

Thus can the reader learn to see the fulness of the world of insects ; a replenishment with life, which alone bewilders him among incomprehensible numbers, which would suffice to bespeak the Creator's intention, though there were nothing more ; while the design cannot be doubted, when we look at the appointed means, the universal food, the universal dispersion and residence, the fecundity, and the incredible number of species, with the variety of structures, magnitudes, powers, and inclinations, conferred on this astonishing mass of separate forms. But if it is given them to enjoy, so do they form a fearful power in the world, which He alone who created them knows how to control. Did the Locust always multiply to the extent of its food, as it sometimes does, it would consume the food of all other animals, and might even destroy the vegetable creation itself : as the Termes might consume the very trunks of the forest, and lay the earth bare, demolishing even

our houses and our ships. Other species, living everywhere; occasionally swarming everywhere, would, for the same reason, utterly consume, not only our stored provisions, but the very hopes of our agricultural produce; leaving man and all other animals a prey to famine; nay, exterminate all which the earth bears, except its metals and its rocks. Even all this might they do, were their populations measured by their food. It is a terrific power; and, against it, man is impotent. He has wisdom and power to control the terrestrial races of birds and beasts: he is armed against magnitude. But against minuteness, he is powerless: his wisdom and his weapons fail, before that which seems the most contemptible. There is not a year of his life in which he may not be overwhelmed and destroyed by beings, of which millions would not make up the bulk of his body, of which he may crush thousands with his foot: by swarms, of which he knows not whence they come or whither they go: swarms, which in a single species, might fill the air which he breathes, and suffocate him, lay bare his lands in a day, and devour the flesh from his bones.

The law of food is not the law here: it is not by this that the insect multitudes are governed; for it abounds and yet they fail. There is no check from this law, to the Termes, while there is a fragment of wood; nor to the Locust, while there is a green leaf left on the face of the earth. They are produced every year; why do they not cover it from one end to the other? They proceed across it in clouds and in torrents; why do they cease? their food is still before them. Their enemies may destroy, but they cannot control them; they are armies opposed to single individuals. The shortness of their lives does not diminish their forces: other multitudes

replace the fallen hosts before they are missed. And it is thus of all.

We know not where the power of control lies : the Creator has retained it in His own hands. He will not allow us to enter into His secret counsels. Is it to teach us that the Power is His, that we are under His protection, not our own : and to teach us also, that He might sweep man from the face of the earth by the most insignificant object which He has created ? Has He not said that He would "hiss for the fly ?" Has He not often shown us, that even thus are the means of punishment or destruction in His hands ? History abounds with the proofs : and if there is one who does not believe that He once thus punished Egypt, natural science will at least assure that person, that He might have done this without even that miraculous interposition which disturbs the order of nature, the favoured rule of government to a small philosophy.

But He is the enemy of these hosts when He thinks fit : He is their Master, as He was their Maker ; He governs them as He created them. He commands the locusts to go to the sea : they obey Him, and they perish by millions. He has no further use for them : they have executed His orders. He does not call for His winds to sweep them away to destruction, for then might we doubt His government ; but He speaks to them and they listen, He controls their wills, and they conform to His Will. Adverse gales cannot tempt them to rebel : for the command which they have received must not be disobeyed. If we do not see His hand here, where shall we see it ? Ancient piety, concluding thus, would have concluded without proofs : modern science, searching creation, produces them : can this be the reason for its doubts ?

The mass of the waters must be examined once more : I have not yet noticed the smallest portion of what they contain. The extermination of all the preceding races and numbers, would not remove more than a few zeros from the incalculable line required to express the amount of life remaining in the ocean and the waters of the earth. But here I must content myself with numbers alone, for our ignorance allows of nothing more ; as I can also pay but little attention to the arrangements of natural history. It is at length a pure question of replenishment, of the fulness of the earth with life.

The Crustaceous animals form an enormous population, while their exceeding fecundity is visible in the multitudes of their eggs, and in some, as the shrimps, by their visible abundance : while of this, a more perfect notion may be formed, by knowing that the Cancer oculatus is a principal food of the great Whale, than by the consumption in which ourselves are concerned. These are crowds which scarcely leave room for motion ; and the reader's imagination may be allowed to form his own estimates of these and of many species more, scarcely less numerous and prolific. Though I need not continue to speak of magnitudes which range, here, from the great Crab down to microscopical minuteness, I must remark, that under the latter sizes, I have added sixty new species to the former list, during a very short research ; each of them so numerous as to crowd the sea for hundreds of miles : whence it may be conjectured what the total amount must be, and how many new species must yet remain to be discovered. I pass over the Arachnidæ of natural history, as of no importance for the present purpose.

The Shell fishes, estimated by some at four thousand species, and by others much higher, add another form

of life and abundance. Of the fecundity and the populations, we however know but little ; except in a few familiar species, such as the Oyster, Cockle, Muscle, Whilk, and so forth ; while, for want of living evidence of numbers, we must have recourse to the remains of ancient earths. Here we find evidences, in the immense tracts and mountains of limestone produced from their shells ; as we also find the shells themselves, forming entire ranges of hills, and in crowds which defy all computation ; as is notorious in the Miliolites, Nummulites, and others. Hence may we not unsafely conjecture the amount of this living population existing at any period : while it is a population also, which occupies no space, since it forms the soil itself : thus filling useless blanks, while aiding the general replenishment.

I need not take the next sets of animals which occur, under the same detail. The arrangements of natural history are here useless for my present purpose ; as the general ignorance respecting most of these, further than as arrangement and structures are concerned, allows of no remarks bearing on the present object. We must be content with inferring, that as variety and multiplication of species have everywhere else been made the means of replenishment, so is it the result of the incredible variety and numbers of forms in these tribes. To notice a few of the best known, must suffice ; as it will aid the reader's computations respecting the rest.

There is an immense body of Mollusca, of animals constructed on the same principles as the shell fishes, some of which are attached to shells without residing in them, as others are independent, and free as the fishes are. In the former states of the earth, the first kind constituted a very great population, as we know by the shells that remain : how far it extends now, is not very

well ascertained, though the Molluscous testacea have been estimated at seven or eight thousand. In the latter division of these animals, some of the Cuttle fish must exist in enormous numbers, because they form the food of the great spermaceti Whale. But compelled to hurry through a tribe of which so little is known, I shall dismiss them by naming the Clio, aiding to form the food of the whales of Greenland, and by remarking, that in a great number of other genera, we equally know of species which swarm in the ocean as the locusts do on the land, so as to give the water the appearance of a solid mass of life. We cannot doubt, at the same time, that all this variety tends to complete a scale of successive prey and food, and thus to aid in maintaining a replenishment greater than could have existed under a more limited number of sizes, forms, and powers.

Under a very different anatomical structure, I must point out a race where there is evinced a very strong intention on the part of the Creator to fill every possible place with life. It is not a case remarkable for numbers; but it is striking in another manner, under the general question of replenishment. It is like the lichens, clothing the rocks which no other plant can occupy, or like the parasitic plants and animals, a heaping of life upon life. In the class of the shell fishes, the Lepas of the rocks is their living lichen: as are the Limpets, and more in the same tribe, adhering also to plants, and even to other shell fishes, and thus extending their places in the world. In the present tribe, the Sabella fills acres of sand with its colonies; as the marine Lumbricus becomes the counterpart of the earth-worm; while the Serpulae make room for themselves everywhere, the universal parasites even to reduplication on their own races. And, corresponding to terrestrial insects, the

Barnacle and the Terebella find a soil, a residence, and a food, in casual timber ; as the Pholades, in this exceeding even the species of the land, excavate their abodes in rocks.

Out of the radiated animals of the very wretched arrangements of natural history, I must select the few kinds which can be brought to bear on the present question ; while the informed naturalist can add other species which I might in vain attempt to describe to a general reader. There is reason to believe that the great races of the *Æchini* and *Asteriæ* form very numerous populations ; from the great numbers of the species, from their high fecundity, and from the extensive spaces which the former occupy in the limestones of the preceding worlds. The intestinal animals in this division give rise to the same reflections as the *Sabella* and the *Lepas*, and as the larvæ and insects which inhabit animals. The *Medusa*, comprising many hundred known species, to which additions are ever making, displays one of the most striking examples of multitude, as well in the larger kinds as in those extremely minute ones, to the species under which I have made so many additions, in a time so brief and a space so narrow, as to cause me to believe that we do not know the least part of this already extensive genus. They are the prevailing sources of light in our seas, as I formerly said ; as, by even this we know their multitudes ; while they for ever swarm in such crowds, that the water can scarcely be discovered among these masses of life. It is a genus which probably, in itself, equals in multitudes all the fishes of the ocean : and if I add the *Beroes* and others in the same division, it is but to accumulate words, without further aiding the reader's powers of estimate. He may conceive whatever he pleases as to

numbers; since there is little hazard of exceeding the amount.

It is not of much moment here, whether every plant among the Coral tribes be considered as a single animal, or whether a separate consciousness and individuality be allowed to every polypus; though the latter seems the juster view, when the feeding of a separate stomach by hands and efforts, implies a separate desire and volition, and therefore an independent and distinct mind. In either case, the replenishment of the earth will be the same: in the latter, the numbers will be the greater. The total proceeding here, as it regards the former, is peculiar, and the result equally important and striking. It is a parasitical accumulation of existences, as it is the construction of new seats or habitations for life; but it is very different from the case of the Serpulæ; both in the manner and the consequences. The smaller animal becomes the basis and home of infinitely larger ones; it is a rock for the dwelling-place of the shell fishes, a cavern for the residence of the unprotected marine tribes, and, as a depository of food by attracting these, it is a territory for the supply and the resort of the larger fishes of the sea; while, beyond all, the coral animal is an island, bearing the vegetation of the land and the trees of the forest, bearing the animals of the earth, bearing man. This is a design for replenishment, to which we have hitherto seen nothing similar. In all the former cases, the Creator was satisfied with taking the earth as He had originally appointed it; in the present, it is as if He had said, "There is not yet sufficient room for my children, let us build them new habitations, that my world may be filled with happiness."

I need not here name or enumerate species for the purpose of giving the reader a conception of numbers in these tribes: it will suffice, that among the soft corals, I point out the familiar *Sertulariæ* and *Flustræ* of our own shores; and in the hard, the Coral islands of the ocean. In a single *Flustra* not larger than his hand, he must count the animals, not by hundreds, but thousands: in a morning walk, he may collect millions; and were there hundreds of millions in his hands, he would not feel the weight: his single hand will contain more than the numbers of the human race existing on the earth. He formerly saw what was the extent of the coral islands; he knows that over the whole middle ocean, from sixty degrees north to the same extent south of the equator, these animals are ever employed in raising new works, as they have been labouring since the creation, and long before the present earth had assumed its present form. Let him scan those seas from east to west and from north to south, measure the islands, and estimate the growing rocks: let him take a coral in his hand, and see that every inch of it contains twenty or a hundred animals, it is indifferent which, and he may then sit down and try what his arithmetic will do for him. When he has learned to compute the sands of the Sahara, he may attempt this problem also: they are no longer a metaphor. But it is better that he conceive every sand of the African desert a life, and then may he see what is the fulness of the earth.

Once more must he be asked to look at this replenishment of the world, at the mass of living existences which it contains; that he may know what life is, what the Creator has done for life. Natural history has

thrown into one mass what it knows not yet how to arrange, and it terms the whole crowd of discordant species, Infusoria. But the reader must not be misled by this term. These microscopic animals are not confined to vinegar or pepper water; the fresh waters of the land abound with them, the sea is turbid with their multitudes. If I have found, on our own shores, the entire waters, for miles in breadth, and from England even to Shetland, abounding as the infusions do under the microscope, with one species alone, and that but one of fifty before unknown, it is for the reader to conjecture what the species must yet be, to add to the few hundreds already noted; what the numbers, in those warmer climates where such animals chiefly abound, and what population they add to the great crowd of the earth. It is the same on the land: every stagnant pond is a world in itself; and in every green ditch of summer, there is not a drop of water which is not contested for by thousands.

And thus it is everywhere. This is an infinitude of life in itself, in addition to the multitudes that have preceded. The absence of all those would not render this sum more easy to conceive: to add the two, is to add infinite to infinite; for incomprehensible numbers are to us as the infinite: yet even this must we conceive of the fulness of the earth. But this is the replenishment also: it is the filling it, almost beyond fulness, with new forms and modes of life, that the vacancies which other animals could not occupy might not be wasted. And these races perform no visible function, as the coral animals do: they have been created but to enjoy; unless, like others, they form a part of the continuous chain of food. And if such existences are

wonderful under numbers, they are not less so as exhaustions of magnitude: in a merely mathematical view of matter, they would be wonderful; I have shown how much more marvellous they are as anatomical structures, living mechanisms. And, in another view, they tend to confirm what metaphysics believe; that mind is without dimensions, and that perception, consciousness, and will, may exist without space.

What is the character of the Being who has thus multiplied existences, created life in multitudes beyond the mind of man to conceive, to fill every point of the globe, to enjoy, and to be perpetuated, that life may be for ever enjoyed? He was not compelled. Did He intend good, when He gave to them all their several capacities and powers; desires, and the means of gratifying those, as various as their forms. Is He who feeds these incalculable myriads, as He has fed them from the beginning, a beneficent Father? Is there one among ourselves who does this for twenty, for ten? He is a mark for the praise and the love of men. We are overwhelmed with awe, in viewing the power of God in the great orbs of the universe; but to Him, an insect or a plant is a work of equal effort; and can the numbers of those orbs exceed those of the animals in the universe? They do not equal them by myriads on myriads, if all are thus inhabited, as we must believe. We see His wisdom and His government everywhere: but where is it more fully displayed than in the feeding of these multitudes, in the preservation of order, peace, and harmony, in ruling the desires and the wills which He has given, in making this vast and intricate political system work as man cannot make his own do for a few thousands? Can Omnipotence be more extended and

divided than it is here, among those endless beings, of which there is not one that He does not know, since to every one He imparted its life, its body, and its mind ? All this I see ; I behold Him, in the living world, as I see Him nowhere else : for here it is, that I see what I cannot discover elsewhere, the speaking demonstrations of His beneficence.

CHAPTER XLII.

ON THE REPLENISHMENT OF THE EARTH BY PLANTS.

THE present subject is much more simple than the preceding, though the fundamental law through which this population exists is the same. It is on the supply of food that the existences of plants, like animals, depend. But the food of plants is everywhere, because it is in the air and the water; and thus, in arid lands and periods, they may be said to feed through respiration. It surrounds them on all hands, and is brought to their mouths: they need not seek it through locomotion, as this also has not been granted: all they require is a place on which to fix themselves; and thence, under their highly superfluous fecundity, the replenishment is synonymous with the clothing of the earth.

Hence, under a similar title, does this chapter bear no resemblance to the former. The number of species in plants, which was lately stated at fifty thousand, is now supposed to amount to twice that number; whatever other ones remain to be discovered. All can see that the earth is filled with them, to the extent of its capacity: the scale of their magnitudes is unknown to no person, and the picture of one country is that of the world. The numbers of species under families are recorded in every botanical catalogue; and it is under the latter rather than the former, that the separate populations should

here be noticed, if noticed at all. But general views would serve no purpose; and the details are far too numerous, or obscure, or vacillatory, to admit of a place here; as, respecting those also, our knowledge is exceedingly confined and very little to be trusted. Their uses to animals at large have been seen: they are the fundamental food; that first link of the chain from which the whole proceeds, and to which it returns, to recommence the same round. In this chain, the herbivorous animals are chemical laboratories, which convert into that food for the carnivorous one, what its own powers could not: and thus does the most hopeless plant, and even the poisonous ones, as the food of some one animal, become that of many in succession. Their other uses concern man almost solely; and these are as fully described hereafter as my space admitted. Thus forming the basis of all enjoyment to animals, it is a natural question to ask, whether they possess any of their own, seeing that they are living beings. But that inquiry would have been misplaced here: it is reserved to a future chapter (c. 51).

In other chapters, I have described the two leading principles under which the naked earth is clothed, or replenished: they were required for another moral purpose, and can be consulted: since, under physical science, they appertain to the present subject. For the same reason, I have made use of much more that would otherwise have found a place here, in the plans for the dispersion of seeds, the protection of plants, their perpetuation, and more: it is in the reader's power to reunite the whole, if he reads for physical information alone: reading, as I did not undertake to write. That which remains, relates to the qualities of the naked earth as forming the habitation of plants: it could not have

been omitted, though constituting but a part of the whole plan for replenishment. The reunion of the whole will display that plan as far as it is visible to us : and the moral conclusion respecting the beneficence of the Deity can equally be drawn at the termination of this chapter.

It is of climates and soils that I have here to inquire. The former are necessarily various, from the constitution of a planetary globe : the latter, from the appointed, or the contingent, or the necessary differences of the materials of such a globe. And to both leading classes of variety, under many subsidiary ones, have peculiar forms, constitutions, powers, and desires in plants been appointed, that the earth might be full.

It is full, that food might abound : it is filled with variety, that the various tastes and inclinations, of animals as various, should be satisfied, that all forms of life should be fed, and all should enjoy. Was that variety necessary for this purpose ; why might not all have fed on one plant ? It is easier to think than to think enough. If this had been the case, the universe of animals could not have possessed their present forms, their variety of magnitudes, powers, constructions, and more. The chain of animal food could not have existed, the numbers would have been restricted : it would not have been the populous world that I have shown. Their numerous uses would nearly all have failed : but I need not enlarge ; all can see that the whole of the Creator's plan would be demolished. The political system would equally have been destroyed, the government subverted ; since all limitations would cease, where all pursued the same object. Who is there that will invent a new plan for an animal government under such a system ? Even so it is, whenever

we attempt to correct the Creator's designs. Could even any system much more simple have been adopted, so that the same plants should inhabit everywhere, without any reference to animals? Those of the water at least must have differed from those of the land. The Oak and the Fucus, the Rose and the Lemna, could not grow on the same spots. There is a Potamogeton and a Stapelia, because the same form of plant could not have inhabited sand and water. Nothing but a Lichen could have found a home on the bare surface of the rock: and thus much further. But I have also shown the uses of this variety in the clothing of the earth: the proceedings differ, but the replenishment of the world by plants is dependent on their variety of forms and inclinations, even as its replenishment by animals is on those which we find in them.

The necessity for their peculiar or exclusive attachments to climates is not so obvious; but this at least we can perceive. Food is one of the great means of limitation: to localize peculiar foods to peculiar climates, is to draw these boundaries for animals more narrowly and perfectly; and thus to maintain the political order more easily. There may be other reasons: but where we see that so many portions of a plan are right and useful, we ought to believe the same of what we cannot explain, even had we not entire confidence in the Wisdom of the Deity. Nevertheless, we have no reason to believe that the existing variety in plants was necessary for those purposes. Much belongs to uses intended for ourselves; much, apparently, has been designed for our instruction and occupation; and much, very much, has been appointed for our pleasures, in this varied world of beauty and gratification: while

everything proves that variety alone constituted a part of the Creator's plan.

The entire question of climates and soils is far too wide for this place : on both, I must select from that which would demand a volume under the philosophy of botany. If the simplest view of climate is a certain limit of mean temperature, as the extreme cases are found on the shores of a tropical climate, and in the polar regions, while between those there are numerous varieties, this forms but a small portion of the whole question of climate as it relates to plants, whatever it may do as to animals. Though elevation and equatorial distance are convertible terms, for example, in this case, or that a mean polar temperature might be found in the Andes, that coincidence is not the only measure of their different relations to the lives or affections of plants. In this, as in many other situations, the range on each side of the mean may vary differently as to the extent, on one or the other side, or as to duration, on either, though the same mean may be preserved : or it may vary in the number and the rapidity of the changes, or may alternate extremely, or the reverse ; or daily and extremely at the same time, as it does in the intertropical mountains, or extremely and under long periods, as within the arctic circle.

Not to refine on this, however, there are many more circumstances connected with climate, be the mean what it may, by which it is modified in its relations to vegetable existences. Even the periods of sleep are among these : the difference between alternate night and day, of twelve hours each, and that of a day of three months' duration. But the question of light is of much more importance, whether viewed in connexion

with heat or not; since it is unquestionably an independent power, as far as vegetable sensibility is concerned. No heat can compensate the want of it: as is well known to horticulture in the case of fruits and flowers, especially as flavour and odour are concerned: and in the comparison of climates, the success, in this instance, depends more on the quantity of light than the elevation of temperature. Nor is this less true, if less remarkable, in agriculture; though hitherto overlooked or neglected by cultivators and by science equally. In the same region, and even at small distances, where soil, moisture, temperature, and all else are equal, the agricultural value of two spots will be found to differ according to the quantity of annual sunshine, or the freedom from a cloudy atmosphere; as, under this advantage, even that of the lower temperature will excel the other.

If the mean quantity of atmospheric water is a not less important circumstance, under climate, than heat itself, so are there varieties in the mode of its existence or application, which have powerful effects on the constitution and affections of plants. If quantity is a simple basis of distinction, as occurring in that period of the life which forms one complete circle of action in the production of the seed, it is a thing which varies, not only in its daily proportions, but in the manner in which it is applied, the modes in which it is divided, as to times and seasons, in its alternations with dryness, in its combinations with temperature and light, and in more than I can here enumerate. The obvious cases to illustrate some of those circumstances, will be found in Egypt and Peru, where rain is little known, in India and in Africa, where it is periodical, and alternating with absolute dryness under various modes, and in our

own country, where, in different parts, the inequalities of quantity and alternation are considerable ; as, in the western mountainous ones towards the north, not many days in the year pass without rain. Thus also, in the same elevated lands, there are sometimes rapid and entire changes from great moisture to dryness, even within one day ; producing that peculiar climate which is affected by the Alpine plants in general, and for which their constitutions have been adopted ; as the neglect of conforming to this regulation of nature, often defeats our attempts at the artificial cultivation of them.

These remarks concern, chiefly, absolute rain ; as the moisture of inundated lands is also a question of soil rather than of climate. But rain alone does not bound the varieties of climate, as that refers to plants : there are other conditions related to atmospheric water which concern their well-doing or failure, and which thus limit the places of those at least which are possessed of peculiar sensibilities. The dissolved or hygrometric water, under the several variations and combinations to which, like rain, it is subject, is an important circumstance as it relates to them, careless as we may be respecting what concerns even our sensibilities but little ; at least while in a healthy condition : while it often also seems a more effective regulating power, in a warm climate, than even temperature : as is known to horticulture in its stove cultivation, especially as the plants of certain countries are concerned.

If I may substitute the term aërial situation for the word climate, as more properly applicable, this subject is not even yet exhausted ; since it appears that the affections of plants are governed by some properties in the air, independent of heat or moisture as they are

also connected with light, which we cannot ascertain by any chemical means, even when we know the cause ; as it sometimes also happens that we cannot conjecture what that is. Highly sensible and delicate in their sensations as these beings appear to be, and really ignorant as we are of the composition of the atmosphere, notwithstanding the pretences of chemistry, it is easy to allow a great power to these conditions, whether permanent or occasional ; as they may often explain that success and failure in our own cultivation, of which we can give no account, not less than the often inexplicable attachments and repugnances of plants to particular situations. But among causes which may produce such effects, though we do not know that it is the fact, I may point out the following. The density, or weight, differs much, between low and high situations ; and we can conceive this to have a relation to the attachments of Alpine plants. Carbonic acid in excess, and sulphuretted hydrogen, are sometimes present, as chemistry can show : and the latter is ascertained to favour the growth of the fungi, as it is also one great source of what is termed dry rot. But when there are miasmata which are even deadly to animals, though we cannot assign those, it is easy to believe that there are similar obscure substances in the air, capable of influencing plants also, and that in this manner too their attachments or repugnances may be regulated. That they suffer from ascertained poisons is well known ; and their sensibility to aerial ones which do not affect ourselves, is proved by their very general repugnance to dwell in human society, probably in that of all animals, and most strikingly by the invincible dislike of many to the vicinity of drains or other sources of peculiar exhalations. It is hence,

probably, that many of our obscure horticultural difficulties arise ; while there is one cause of those, under this head, of which we are sure, knowing the substance, yet still unable to conjecture how it acts, since it contains the principles of manure, or food. I allude to the smoke of towns ; as there may possibly be more than smoke engaged in this case. To this, there are many plants which bear so entire a repugnance, that they refuse to grow, or die, while some are utterly indifferent to it : as, between the two, there is a great range of sensibilities. Yet we can never conjecture beforehand what these are ; as they often also surprise us, above all when we find the small Alpine plants, allotted to places so very different, thriving in the closest lanes of a crowded and smoky city. This sufferance, however, does not extend to a great number, as I have ascertained ; while the progress towards death is remarkable, since it shows that the vital powers are gradually weakened, as through a premature old age. The first step towards death is the refusal to produce seeds or fruit ; and under a successive failure of flowers, first, and of leaves afterwards, the plant expires.

In a similar manner, the immediate vicinity of the sea affects the actions of these susceptible beings, even where its salt does not act, and where all other circumstances, as far as we can ascertain, appear to be the same. How many are destined to this vicinity, we know ; as it is obvious to say, that a saline soil, or a salt air, is the cause. But salt never exists in the air, otherwise than as mechanically mixed through the violence of the winds ; while the effects to which I allude, are seen in the colours and the odours of flowers not belonging to the neighbourhood of the sea ; in those chemical actions which imply the most delicate

differences and the nicest variations of the vital actions. That the vicinity of one plant affects another, or many others, though not all, is also familiar ; and most so in the case of forests : while not to be accounted for by shade or any other obvious cause, since the same effects are not produced by all trees : as there also are many which, conformably to this great law for replenishment, prefer those shades, or even affect the society of some peculiar one. This is well known as to the Beech, the Ash, the Oak, the common Fir, the Spruce, the Larch, and far more : nor is there any mode of accounting for these effects, but through the unknown influences here under review. That which has been said of the Barberry, whether true or not, is known to every one. But the peculiar and very narrow limitations of the Clove and the Nutmeg, are among the best examples under this head : while of these very singular facts there can be no doubt, after the innumerable trials made to extend this cultivation : though it has been hitherto impossible to conjecture what the causes of these restrictions are, since no differences of any kind can be traced between Banda and Amboyna, and the similar situations in the neighbouring islands. Analogous facts indeed abound in the tropical climates ; as they are often even more remarkable.

But whatever may be these differences and peculiarities of climate, or of air, some plant, or many plants, have been provided to occupy every one, and commanded to prefer some one to another or to every other : evincing the same adaptation between an allotted instinct or affection, and a previous provision, which we trace so widely in the animal world. Discovering also repugnances as well as attachments, no more doubt can be entertained respecting the limitations of

plants than those of animals ; as we cannot but admit that these were equally designed, and for the purposes which I need not repeat. That such limitations are not always rigid,—that there are wide, instead of narrow attachments, and great sufferance where there is no attachment, proves nothing against a design which is as certain, if not so striking, as that which adapted the eye to light : while in all this, there are purposes which we trace very widely and with great ease : as, in the total design, the intention to replenish every atom of the earth with vegetation cannot be overlooked.

It does not require even a botanist's knowledge to furnish the illustration, for which I have no space : I must be content with noticing two of the most remarkable instances, that of moisture and of temperature : selecting these, because they strikingly prove, that the whole belongs to vital action : whence the obvious conclusion already made, that all the conduct of plants in these respects, depends on the fact of their being sentient as well as living organizations. These are extreme cases, where the sensibilities are reduced for the purpose of resisting injurious powers : the cause can be no other where those are more delicate and more various, whether for affection or repugnance, choice or avoidance.

The greater number of plants die, unless their roots have access to water : yet there are thousands created to do without it, as they are appointed to climates and situations which are deprived of water more or less durably. Thus is the far larger proportion killed by the freezing point in temperature, especially under duration ; while there are a great many which resist much greater degrees of permanent cold ; as, but for that allotted power, the arctic regions must have been for ever destitute of vegetation. In each of those cases,

there is the breach of a very general rule; so that the speciality of the appointment is as visible as the purpose. And each object is attained through that mysterious principle of life by which so much else is governed: it remains attached, in the first case, as it does in the seed, although the vital actions have ceased; being the arrangement in the lichens, and in the grasses of the durably torrid climates; or else it is content to proceed under a degree of privation which the lives of other plants would not endure: as, in the last, it is gifted to resist the deadly forces which destroy the great multitude. That there is any utility in extending this power of resistance towards the other extremity of the scale of heat, we do not always perceive, though I must except the *Acacia* of the Arabian deserts, resisting the hot winds which destroy even the Indian plants, and thus furnishing a food for the camel which must otherwise have failed. But though, in the following cases, the utility should be nothing, the facts will confirm our conviction of the seat of this power. The *Agnus castus* (*vitex*), two species of *Aspalathus*, with many terrestrial and aquatic Cryptogamous plants, have been found growing in temperatures reaching from a hundred and seventy degrees to the boiling point of water: as there are also beetles which resist this last heat; sufficient, in the absence of life, to destroy all those organizations.

Did I examine the question of soils under a scientific view, it would demand a greater accuracy of division than I can here afford to give, with much more detail. I must here be content with arranging them all under the heads of chemical quality, or composition, mechanical properties, or resistance, and moisture; as, on neither of these, can I take room to dilate. In the former, passing over much, where it is but the general principle

that is here required, it is sufficient that I name such prominent varieties as the sandy, the clays and loams, the calcareous, the basaltic, and the vegetable moulds, among which last the black, cotton land of India is prominent, as peat is the extreme case. And these, as mere chemical distinctions, give rise to many more variations ; under differences of resistance, and also of heat, and moisture, and more ; so as even to puzzle agricultural writers in their attempts at arrangement.

The extreme case under resistance, is the surface of a rock ; as that of its crevices is not very different. To the lichen, under the former, the place and the attachment are all which the soil affords : and it is little other to the Oak, the Ash, the Birch, and more, in the latter case, or to the Pink, the Sedum, and numerous others among the smaller plants ; since they can derive nothing, often not even water, from that which does but afford their roots a hold. Thus is the bark of a tree often nothing more than a surface for attachment ; as we know in the Epidendrons, equally willing to grow if suspended by a string ; as even the *Ficus occidentalis* will, though naturally a plant of the soil. It is the same in the Birch and the Ash, rooting themselves in the fissures of other trees as they do in rocks. If some, like the *Cuscuta* and the parasitic fungi, find a real soil as well as an attachment, in this and in the other parts of plants, I need not here dwell on well-known cases, which belong rather to the general fact of replenishment. And as I also need not pursue this question of resistance under all its modes, it must suffice to name such examples as those of the half-decomposed rocks, occurring in granite and basalt chiefly, chalk under different forms, the several clays, and the sands ; as the extreme of non-resistance is found in boggy soils and

mud : while the former, deprived of moisture, become, in peat, one of the most resisting, so as sometimes not to permit the growth of almost any plant, except under the aid of art ; long however unable to see the very simple and obvious fact on which its improvement was to be founded, as I have explained in a work on that subject.

In examining soils, if soils they can be always termed, in reference to moisture, the extreme case is the surface of water : while contrasting this with the most remote reverse, the intention of the Creator is strikingly marked in the construction of a *Lemna* and a *Lichen*, of a *Fucus* and a *Mesembryanthemum* ; or of the *Fucus natans*, the *Confervula vagabunda* and *agagropila*, and the great race of *Epidendrons*. It is indifferent also, whether the water be salt or fresh : there are plants for all : as, in other cases, the water becomes the atmosphere of the plant, while the true soil, or base of attachment, varies from the loose mud to the hard rock. The *fuci* are the lichens of the sea : they derive nothing through their roots but place : the ocean is their air. In the next stage we find the marshy soils under many varieties ; while I formerly (c. 11) noticed the plants directed to prefer those, and the valuable uses which they serve. But not to examine all the intermediate stages onwards to the hard rock or the dry sand, where absolute dryness is united to great resisting power in the first case, and to the reverse in the latter, it is sufficient to say, that from the soft bog upwards, through morasses, woods, river banks, plains, and uplands, we find every possible gradation of moisture in the soils, varied also by the different powers of retention, and the several facilities of drainage or evaporation. The rock, under the extreme, can possess no moisture further

than as the attached lichen may retain it in its own substance, or as a casual crevice may prevent it from flowing out: while if the retentive powers of sand are of such a nature that a very small depth of dry surface will restrain the evaporation from beneath, thus pointing to the source of agricultural results that have often seemed mysterious, as to uses which have not yet been derived from this property, while further indicating one of the unnoticed contrivances of the Creator for a valuable end, we nevertheless know that it is often for many months in a state of absolute dryness, though its vegetable tenants should have been wetted by the dews, under a law respecting the formation of dew, which we need not refuse believing to have been directed to this end, though knowing that it depends on the general laws of heat. To every one of these varieties also, there is a peculiar set of plants assigned, with a multiplicity of constructions and powers not less remarkable than the peculiarities of their affections; continuing, still, that proof of the adaptation of powers to desires, which pervades the whole organic creation.

The consistency and perfection of the whole design are here so obvious, that it is as superfluous to urge the intention as it is to dwell on the execution and the success: it is among the cases in Creation where we best trace the Creator's purpose and plan: while, as such, it may be added to the proofs in the first division of this work. Science indeed might desire illustrations far more wide than the very few which it was convenient to note in passing. Were it even necessary for the present purpose, I could not here admit those, under the most general views: while a slender botanist can easily furnish catalogues, of which he may perhaps also boast, under the usage which considers knowledge to

consist in small details. It is better that I occupy the space which can be spared, with some general remarks in extension of those which have preceded.

If every climate has been occupied, it is notorious that the numbers, both in species and in respect to population, are far greater in the hot climates, and diminish as we recede from the equator or from the surface. The reason is apparent in the extreme case, since the food of plants depends on the fluidity of water : as heat, independently of this effect, is concerned, we only know that there is a general law of animal life, under which a particular range of temperature is necessary to the activity of the nervous power ; while some similar law holds also with respect to chemical action, though we need not speculate on any necessary connexion between those two. And the nervous or vital power, with the chemical proceedings of plants, being similar to those of animals, perhaps even identical with them, the obvious consequence follows : though, could this be denied, our knowledge that both heat and light are stimuli to the vital and chemical actions of plants, would suffice for the present purpose.

Hence the incredible profusion, as well as the rapidity, of vegetation in the intertropical and flatter regions, where both the circumstances favourable to it abound : the whole surface being so crowded as to repel man, and even many of the larger animals, while the trees are also the supports of those endless parasites which render these forests an impenetrable mass of vegetable life. Nor, though the cause be a general one, being also a necessity, since heat must have especially existed in these regions, is this result a contingency devoid of purpose : as in every other case of apparently necessary causes, the effects form a portion of the total

plan. The constitutions of animals are equally restricted in the power of bearing very low temperatures, though excluding cold, to a great degree, by the generation of heat: while this is peculiarly the case with the cold-blooded animals, which produce little; including, especially in the insect races, an immense aggregate of life. Hence these have been appointed in the greatest numbers to hot climates; as, when to colder ones, only to the period of profuse vegetation: and thus has the food been made to keep pace with the demands of those for which it has been destined. The decomposition of organic matters is also much most rapid under heat and moisture; whence a greater production was admissible: and thus under an adaptation not less beautiful than every other, that law for dead matter through which it becomes capable of producing new living forms, is made the same law through which the living powers can re-organize it in proportion to the supply.

Proceeding towards colder regions, we still find successive constitutions adapted to every one; not even disappearing in the regions of perpetual snow: since one minute fungus at least, the *Protuccus nivalis*, has passed the boundary at which even the lichens are ordained to stop. And here it is that we must pause to admire that appointment already named, through which so many plants not merely attach themselves exclusively to cold regions, and even to the limits of perpetual snow, but by which they also resist that influence which is death to others; as, if in a less degree, we must admire their powers of hibernation, of their cessation of all action, in the climates of alternate heat and cold. Nor are these the only subjects of admiration under those appointments. It is not less mysterious, that many plants should choose to flower during the period

of cold, and even of the great diminution of light ; when there is heat yet to arrive, with light, and when these are the great stimuli to their actions, and to this important one above all. The conduct of the Snowdrop appears anomalous and unreasonable, but it is countenanced by many more : it appears more unreasonable still, that the Ivy, and the Colchicum, and the fragrant Tussilago, should refuse to attend to the calls of light and heat, waiting to flower till the winter and the cold are impending ; while many also persist, as if they preferred cold to heat. But all have been equally ordered to choose ; and all obey. And this last is a greater mystery than the simple resistance of plants to cold : while we have not yet assigned good reasons why they do not freeze ; nor can we yet prove that they generate heat, notwithstanding some facts which seem to imply a low degree of this power.

But be the efficient causes what they may, thence arises that succession of flowers, which, while it is a source of pleasure to ourselves, is rendered of utility to the insects which feed on their honey, and which, but for this provision, would die for want of food, when produced out of their seasons, as they often are, by casual heat. Thus, in addition to those just named, our own climate affords, whether in natives or naturalized plants, the early Calycanthus, the Anemone, the Mezereon, the Hazels and Willows, the Draba verua, the Violets, the Ficaria, the Sloe, the Primrose, and many more ; while the opposed season calls into bloom the Hellebores uniting both extremes of the year, with the somewhat earlier Asters, the Chrysanthemum, the Amaryllis lutea, the late Crocus, and the other liliaceous plants of autumn ; as the never-ending Cardamine, the Alsine, the Furze, the Laurustinus, the Vinca,

the Wallflower, the African chrysanthemum, the Chinese rose, and others, scarcely leave an interval in the whole round of the year in which flowers cannot be found, did we second nature by our own exertions.

If the preceding remarks on succession may be thought digressive from the immediate subject in hand, so will I extend that digression by pointing out the different durations of flowers; since in this also there is often beneficence, both to man and the insect tribes, as the fact itself is interesting in the philosophy of botany. I can however but afford to indicate the fragments of a sketch which any competent botanist can easily fill up.

Taking a single flower, there is a long range between the less than ephemeral life of the *Cactus grandiflorus*, and that of the *Musa coccinea*, whose duration extends to two months, while the *Cistus*, the *Hemerocallis*, the *Rose*, the *Tulip*, *Hyacinth*, *Auricula*, *Dianthus*, *Sunflower*, and many more, are flowers of varying intermediate lives, to which it would be easy to add many in completion of such a sketch. If again we take the plant itself, we find analogous differences of duration in the period of its flowering, as, for many of those, specific provisions have been made. Such, where a long duration was intended, are the unrolling of a spiral, in the *Heliotrope*, the *Forget-me-not*, and other *Asperifoliæ*; the contrivance of spikes, and that of corymbi, as in *Veronica*, *Asphodelus*, *Aletris*, and others, in the first case, and in the latter, in *Laurustinus*, *Hydrangea*, *Iberis*, and many more. In other cases, with a similar view, and without any special contrivance, there is a constant succession of flower-buds produced, for comparatively short periods in the *Roses*, the *Pinks*, and many more, and without apparent end in *Vinca* and

the Wallflower as perennials, and in *Tropaeolum* and the Sweetpea as annuals ; while to each of these I might add a long list. And if, reversely, I name but the *Syringa* and the Horse-chestnut, as examples of plants whose period of flowering is transitory, it is that I may terminate a short digression scarcely so relevant to the subject before me as it is to the art of gardening ; though it is but another of those which I have introduced into this chapter with a view to this delightful art.

If the considerably accurate, and often exclusive, choice of different plants as to climate, is a fact as remarkable as it is generally known, it excites far less notice in passing through the climates between the equator and the pole, than in ascending from the former towards the zenith of perpetual ice. The climates are narrower and better defined ; while the precision with which they are occupied by those which have been commanded to prefer them, have often been pointed out by naturalists, under the affected term, the stratification of plants. The fact is valuable, because only thus could we have discovered that precision : as to aught else, it is but that climate which we could not equally have defined on a meridional line, from the great irregularities of the earth's surface, and other obvious causes. Thus are their instincts of affection and aversion more fully displayed, because there is less to interfere with their conduct as to both.

The consideration of the allotment of climates to plants, leads, lastly, to a somewhat collateral question, yet too important to pass by here, since it concerns the beneficence of the Deity, as the fact of the replenishment of the earth by them does : independently of an interest of another nature, yet which would not otherwise have justified me in examining this question. Everything

has been given for man's use ; but the possession of all is not given : he is commanded to exert his faculties for that purpose, and thus does the industry of his races continue to augment his acquisitions. The compulsion, like the gift, is an act of beneficence : I have often pointed that out. Those gifts are also limited in place, while he is unlimited : his exertion, then, is commerce united to industry : he obeys the command, and he profits accordingly. All plants cannot exist where man may, any more than all animals ; and thus has he been very largely deprived of their uses ; yet not perhaps under the necessity, in which his indolence seeks consolation. In the next chapter, this question is examined as it relates to the latter : if I here notice it as it concerns the former, it must be with great brevity.

I need not say, that if man could carry with him, wherever he goes, all the vegetable world, he would not only add much to his uses and enjoyments, but materially increase his numbers. What the potato has enhanced on wheat, the plantain would double : the wide-spread vine would extend its range : while, on what he might derive in many other ways from innumerable plants, I need not enlarge. It is true, that there are restrictions which have been appointed for the very purposes of commerce ; as we cannot doubt, seeing its high value, in its numerous influences on the condition of man, throughout the world : but experience shows that they are not universal, nor always rigid.

This is the case with respect to plants : though we are more ready to believe in the restraints on these, as heat is concerned, than in the instance of animals, since they have not the same powers of producing heat or repelling cold. Notwithstanding the general affections and limitations which I have pointed out, there

are many specific exceptions. There are numerous plants which possess a great power of forbearance or endurance as to cold, nor can we ever anticipate where these peculiarities exist. If a few seem to be rigidly confined to a narrow space, as to some particular situation, as the Clove is, we cannot decide that even this is a rigid limitation ; because we see that mere heat is not the cause, and do not know what that is. Finding also that the inequalities of constitution in the plants of a given climate, do not depend on their elevations under it, we are assured of a fact, a real difference in their resisting powers or durabilities, which it is our business to investigate, that we may turn them to use by extending their range to other countries. I need scarcely point out the great range of Wheat and Flax, or of the Vine ; as the reasons for that are also apparent in their uses : but if it is an unexpected event to find the West Indian Panicums and the Canna willing to live in our own climate, as I might add many more parallel cases, it is but reasonable to make much wider trials, where nothing can be foreseen.

This is the most obvious proceeding : and it has already been attended with a new success, under these very suggestions, though the trials have still been very limited. But it is not all. The plants of a warm climate can be induced to bear a colder one, by cultivation and propagation, as animals have unquestionably been. I have said, in another place, that we do not know how cultivation acts ; what it is, under this term of no meaning in the present case, which produces the effects that we experience ; but we find that one of the results is, the production of varieties in a posterity. I do not mean to say, that the successive seeds of a plant will produce a successively hardier progeny, if continued

to be sown in the same cold climate : this appears to have been an error of the first speculators on this subject. Every fruit and flower and plant of our own climate, which we possess in a condition that is not the natural one, is the result of this process ; as is every unnatural one, from whatever climate. And it is a plant of different properties ; often of a different constitution, in every sense. The cultivated Carrot is of a different chemical constitution from the wild one ; since it secretes sugar and loses its wood. The wild Cabbage produces two different constitutions, even as to hardiness, in the brocoli and the cauliflower : since, to flower early, is to bear a colder climate : it is as if we could produce a variety of the Provence Rose to flower with the Snowdrop. It is the same of much more as regards the plants of other climates, inhabiting our own under cultivation. The Peach bearing ripe fruit with us, is a hardy variety of that plant bearing ripe fruit in its natural state, in its native climate, wherever it chanced to be produced ; as itself or its congeners have sometimes been with ourselves. Were it in its natural state with us, it would be no better than an Almond or a Crab, for want of heat ; as our Plums would be Bullace or Sloes. And as in the cabbage, there are different constitutions in the cultivated varieties of this plant. If it is not absolute hardiness, in the usual sense of that word, it is equivalent, under the question of heat, to possess an early variety ; since it has required less heat to bring it to maturity than a later one. And be these varieties produced wherever they may, be the fruit what it may, every plant which is not as the Raspberry with us, and which yet produces ripe fruits and seeds, under cultivation, is a hardy variety ; when, in its natural state, it would only have produced fruit in its

native climate, like the Guava and the Mangosteen, or in the artificial ones of our stoves.

But the true state of the facts under this cultivation has been misapprehended or overlooked. All varieties in plants are produced from the sowing of seeds: beyond this, we possess them only by continuation under the several well-known modes, which do not produce a new plant, but divide the old one into other lives: And among the varieties of constitution thus produced, hardiness is one: there is a variety capable of bearing a colder climate, as there are varieties of chemical constitution and of form. But, in nothing, do all seeds produce variations from the parent: a whole generation of seeds may not produce one, or the seeds of a variety will not reproduce the same. Or there may be one seed out of many, or out of a whole generation, or many generations, which produces a variety. It is then termed an accident: it is the history of the familiar Ribston apple, as of hundreds more. In the same manner may a hardy variety be produced: and in this way have hardy varieties occasionally occurred, as in the grape for example: since a vine, bearing early grapes, or ripe grapes without failure, in this climate, is a hardy plant. It is a naturalized vine: the object so despaired of, is attained. Our rule of conduct then seems plain, if we desire to naturalize plants, of whatever nature, or for whatever purposes. It is to propagate by seeds; nothing is gained to this end by division and continuation. But is also to watch the progeny: where; if we should often fail, and perhaps fail for a long time, we may still succeed; while we shall assuredly never succeed without trial, and probably not without labour and patience. Short of this, it is to import from other countries the hardier varieties of plants as well as the

hardier plants ; while we have inquired of the former even less than that of the latter. It is possible that the native climates of those plants might produce the desired varieties, though our own did not ; just as we have produced in England an early Pea or Bean fitted to the inferior climate of Scotland, while flowering there only in September instead of May. And this is naturalization : our posterity will try what we refuse to believe in ; and there will be another posterity to enhance on them : with the primary consequence of materially affecting the replenishment of the earth, whatever may be the ulterior ones.

It is true indeed, that it cannot well be fuller of vegetation ; but mere replenishment is very different from that fulness which would be most useful. The substitution of corn for forests is that of an advantageous for an unprofitable vegetation ; the whole system of agriculture is the same ; and every country of Europe, with many others, is under a system of naturalization in its plants : although this may not often consist in the adoption of those from warmer climates ; yet doing this more extensively than appears on a superficial view. In thus labouring, man has not only conquered the inclinations of plants to climate and to soil, but he has even created soils and altered climates. But he would do far more, should he extend the system of naturalization more widely, in the further conquering of climate ; since it would be to create a new and a better world of vegetation, in those lands to which he has wandered from the regions of the sun. The general results need not be suggested : and who is there to assert that this can never be, that it is not even within the plan of Providence, ever improving the earth through His various agents, and, through man himself, with the most incre-

dible results? though individual man, feeling the little which himself can do, easily forgets what his races have effected. He did not know till he was informed of it, that the Creator of the earth was for ever extending it, for ever creating, to meet the ever-increasing demands of men; that this was in His plan. He could not have believed in aught so improbable: he would not have believed that Providence might, by the mere transference, not by the creation, of an obscure plant, double the efficient territory of Europe, by doubling the food it produced. But he is compelled to believe in what he sees: and how then does he know that there is not yet a plant beyond the potato, perhaps many plants, in reserve, among which the yet problematical *Oxalis crenata* may possibly be one, to continue that plan which is so clearly indicated? He does not know this: but at every successive stage of his improvement, he has equally determined that he had reached its limits: he is not less certain in the present case, than he was before the discovery of the magnet, the art of printing, the telescope, and the steam-engine: ever self-satisfied, always knowing everything, though still desirous and dissatisfied, and thus making his vanity the check to that active discontent which is among the most useful principles of his nature, and the groundwork of all his improvements.

On the subject of soils, as on that of climates, it only remains to extend and add to some of the former illustrations; though far too wide a subject to admit of more than a few detached remarks; as my purpose is served by turning the reader's thoughts to this mode of contemplating the objects around him. As the chemical qualities of soils are concerned, the plants assigned to the calcareous ones are not less distinguished in the

eyes of a botanist, than are the lands themselves, by their variety, and the frequent conspicuity of their flowers: while the affections of others to them are known to the planter and the agriculturist. If I name the Beech and the Saintfoin, as two examples under the last cases, and the Elecampane under the former, it is enough: as it will suffice, that without refining on this subject, I notice a few further examples of the attachments of distinct plants to soils as distinct; not having space even for a connected sketch of a subject, which any one who understands thus far, can easily execute for himself. The Oak is attached to the same variety of clay as Wheat is: the Parsnip chooses a deep soil, the Carrot a light one: the common Fir seeks a thin as well as a light one, and it has been constructed accordingly: unlike the Oak and the Parsnip, its roots refuse to descend, but they compensate this, by spreading widely beneath the immediate surface; so nicely are the inclinations and the powers adapted, here also. If this tree is willing to grow in a sandy soil, the Carex and the Elymus of the sands prefer it, and refuse every other; while the Salsola and the Eryngo are not content unless their sand be salt. The Spruce fir prefers a wet soil, as the Stone pine does a dry one, the Hemlock fir a swamp, and the Larch, alpine with the smaller alpine plants in its feelings, that which is often wetted and easily drained. The Chestnut flourishes in the gravel which the Ash refuses; the Alder prefers that wet manure, among woods and by river sides, in which the Beech expires. The Reed and the Willow seek the stiff and deep mud which the waters lay down, the Zostera refuses all but submarine sand, and the choice of the alpine Lobelia is among subaquatic gravel and stones. The dry and sandy peat is the home of the Heaths, the

tenacious and the wet is that of the *Eriophorums*; and the bog is selected by the yellow *Scirpus* and the matted *Nardus*. The *Salicornia* and the *Crithmum* equally seek a marsh; but, for them, it must be salt; while the Mangrove will not thrive unless its roots and its trunks are washed by the sea, becoming, like the rocks themselves, a residence for shell fishes.

If these instances comprise not one out of a thousand under the Creator's laws on this subject, and if, in conforming to them, we have sometimes learned to profit, it is certain also that we have too much neglected them. Agriculture indeed has been compelled to learn them and obey them, under that argument which does not easily fail to convince: but it is not so with horticulture: it is scarcely even yet so with planting. With but trifling exceptions, the same soil is allotted to all the plants of our gardens, in defiance of nature: and thence doubtless many of the failures which we are troubled to explain, yet not unattended by some gain in changing the character of other plants. The desired chemical secretion of the Horse-radish is destroyed by a rich soil, because it was appointed to a poor one; if, in return, the acrid and poisonous Lettuce, its companion in the same lands, is rendered a useful vegetable. Thus of far more, in all the departments of this branch of cultivation; in flowers and in fruits, as in ordinary vegetables: while, if it is for science, not for me, in this place, to investigate this subject further, so is it for science to turn to what it has neglected, and to be assured that the basis of its improvements must be sought in the laws thus appointed to the vegetable world, that the earth may be occupied.

If this remark, like those on naturalization, is an economical one, it is not irrelevant to the present sub-

ject: since the beneficence of the Creator in replenishing the world with plants, is directed, among other things, to the uses and the pleasures which man derives from them. Rather, it is the very object in view, the great fact to be inculcated; and I shall therefore condense the remainder of the similar remarks in the same place.

The subsilvan affections and repugnances of plants have been just alluded to: but so far from attending to these, in our cultivation, whether for use or pleasure, we have not even investigated them. Under the general law of replenishment, we can safely infer that there would be no blanks, even in the forest; and, under nature's management, we see that there are none: our own woods are filled, they are even crowded, if not to the same density as those of the tropical regions; though, in neither case, need I point out the plants, whether for affection or dislike. It is often important to fill blanks in artificial planting: it is frequently thus desirable to render the half-vacant shrubbery ornamental, by means of flowers. But we commence by disturbing the order of nature, and forget to do enough: we naturalize the tree and the shrub, and neglect their humbler associates: or we remove them from their allotted places, and leave their companions behind. When do we ever profit by neglecting or counteracting the Creator's intentions? In this too we have much to learn.

I formerly alluded to the larger and more conspicuous plants which follow the lichens and the mosses in preparing soils, and which have also been appointed to clothe the naked rocks, covering even the works of men, by rooting in their fissures, even on the faces of the naked precipice. To the few names there given, I

might add hundreds, including some of the most ornamental plants and flowers in nature ; as, to those which I have registered in our own country, in another work, foreign lands might add thousands. Much was done that even these hopeless surfaces should be covered with vegetation, when these plants were taught to live without access to water, when they were empowered to nourish themselves through respiration, when their seeds were ordered to grow on the dry rock, so that they should not wither away even when the sun arose on them, when their roots were gifted with the power of penetrating every where, and even of splitting the solid rocks and the towers of men. Here too, nature has even taught us how to ornament as well as to occupy ; but as before, the lesson is thrown away on our negligence.

I have shown that plants are possessed of affections and dislikes for what we cannot discover in the air. To learn what these facts are, will form a new and important step in cultivation ; as it is for our interest to investigate them. The example is before us ; though the advantage may be deemed trifling by those who have never suffered from that craving instinct for the least traces of rural nature, which is never quenched, even in the condemned prisoner to towns. I have pointed out elsewhere a long list of the plants which feel no repugnance to crowded and smoky cities : it is for others to extend that catalogue, and to profit : while, to neglect this, is to neglect what has at least been permitted, if not appointed. But it is unaccountable negligence, which, knowing the successions of flowers, knowing those which flower in winter, knowing those which never lose their foliage, is careless of that succession, and, above all, does not cultivate a winter garden, when the usages of society have reversed

the seasons for the town and the country. The laws of vegetation were intended for this also, amid all else : but they are appointed and despised. We can never be blameless in throwing away the Creator's bounty : but in these cases perhaps, the sufficient punishment attends the fault.

Yet we have not neglected everything : it is but to proceed. There is a law of vegetation, formerly noticed, through which, as one plant prepares the way for another, under a continuation of that plan by which the lichens found a soil on the rock, it abandons the place on which it has performed its office. It will grow there no longer : but its successor takes possession. The cultivator's crop is thus followed by weeds, if it has not previously been encumbered with them : he has discovered that he must change it for another, if his failure to reproduce another did not warn him ; for even those weeds teach him this law : as the horticulturist is equally taught by the cessation or death of his fruit trees, if profiting less by the warning. The plants of the moor have done their duty ; but they continue under successors equally worthless, because nature cannot always sow the wide waste of peat with the seeds of grasses. The cultivator has at length learned this also ; and he excludes them for ever, as he may further prepare a soil for future corn. And thus does he bind his maritime sands and his river banks ; in this also following the proceedings of nature for the replenishment of the earth.

Unable here to pursue the subject of soils and their related plants much further, I must terminate with a few remarks on those which, next to the lichens, possess the most striking interest under the intention to fill the earth ; from the great peculiarities of their affections

and constitutions, and the very unexpected places which they occupy in it. To him who knew only the terrestrial plants of Britain, or of Europe in general, and who might be justified in supposing that the world contained no others, it would appear very improbable that there were any so constructed as to live without water, or any appointed to live without air. Yet such plants have been contrived in the inhabitants of the torrid sands, and in the submarine world of plants : that no place should want its population, in the plant first, and in the animal afterwards. The Mimosas and others which affect the dry, and often salt desert, are the food of the camel ; the bulbs of Ixias, of Grasses, and more, are gifted with the extraordinary power of retaining moisture and life in the midst of aridity and death : and the Cactus, the Mesembryanthemum, the Aloe, and others, have been so constructed as to serve the joint purpose of food and drink, where water was unattainable. Here also, if the intention is evident, the provision is especially remarkable ; since here, if anywhere, we should have expected an arid plant, conforming to its imperfect supply of water ; while, on the contrary, we find this aridity in the Potamogetons and Zostera, residing in the midst of water. I need not say that it is in the submarine plants chiefly, that we find those which dispense with air ; respiration water, as plants respire, in conformity to the animals to which they serve as food, while serving the purpose of food also, to the amphibious Manati and Turtle : as those of fresh waters do to some of the aquatic birds.

It remains to notice the miscellaneous tribe of Fungi, which add to the replenishment of the earth, often without occupying soil ; parasitic, like the lichens and the serpulae, and performing important duties in cre-

ation. They are largely the food of larvæ ; if there are, still, many for which we can as yet discover no purposes. But, like some in that race, they have a further destination, and an analogous one ; being appointed to destroy, and return into the general circulation, dead vegetable matter, as it is the office of those to remove the spoils of animals. The fallen wood, in particular, is useless to future vegetation while it is undecomposed ; as it also encumbers the ground and impedes a new growth of plants. In the tropical forests, especially, the evil would be great : as, here, these fungi are peculiarly active, while they are aided in their work by appointed coadjutors among insects, and above all by the Termites : as with us, by the woodlouse and others, but too well known from their ravages on living trees. If but very imperfectly acquainted with them, the names of *Boletus*, *Mucor*, *Uredo*, *Sphaeria*, and *Trichoda*, will here suffice ; as many of these are also familiar to more than those who know the names of botany. These are the rust and the smut so dreaded by the husbandman : and they are also the dry-rot, the even greater object of terror, and the pregnant source of empiricism, under an ignorance which, in seeking imaginary remedies, neglects the real evil and the means of prevention. It is difficult to prove that the seeds of these fungi circulate with the sap of the tree, or that the plants are produced as Hydatids are in the animal system. It is certain that, in many cases, they arrive from the air, and attach themselves to the places of their destiny,—to a favourable soil. That favourable soil is wood in the act of decomposition through the joint effects of water and air ; as their determination is also favoured, and their growth accelerated, by darkness, and by the presence of the chemical gases resulting

from decomposing organic substances ; in this showing their desire for what is abhorred by most if not all of the larger plants. And without their presence, wood is equally destroyed under these circumstances : as the far greater number of these imaginary cases of dry-rot are no other than this, the usual chemical decomposition of the hard vegetable fibre : while it is now easy to see, that the leading evil arises from conjoined neglect and ignorance, and where the remedies ought to be sought.

But I must conclude. We have seen the varieties of climate in the earth, so dissimilar as to present the most absolute opposition ; the varieties of soils, differing, even as the bare and dry rock differs from water, and, between those, intermediate conditions, of which I have not enumerated the smallest portion ; as time and space would fail in attempting to point out those which occur from the endless combinations of all those circumstances. We have elsewhere seen the general similarity in the anatomical structure, in the physiological conduct, and in the chemical powers of plants : while, knowing that the choices or desires, the affections or the dislikes of animals, depend on mind, are the results of feeling, and are demonstrated through will, following comparison, we ought to have concluded that the affections of plants should be uniform, or indifferent, that all should be found anywhere or everywhere, except where their peculiar external forms rendered that impossible. And if pronouncing nothing respecting their desires towards peculiar climates and peculiar soils, least of all should we have believed that any of them would prefer cold to heat, and aridity to moisture, when heat is their life and water their food. Yet because there are all those diversities in the earth, we find a corresponding variety of affections and dislikes

in plants ; as strongly marked, and producing limitations as rigid, as if they were possessed of feeling, discernment, reflection, and free-will.

How is this ? It is so ordered by Him who orders all things. Is He their mind : or has He really communicated to them living instincts, powers of mind, minds ? The latter cannot be granted ; the botanist smiles at the supposition ; the metaphysician deems it insane. They are anatomical, physiological, and chemical differences of constitution. It would be better to prove this than to assert it : to show how these could thus act, were their differences proved ; how aught which is not life and feeling can perform the functions of feeling and life. But if the usual philosopher abhors the first suggestion above all others, this great problem has not been executed without means ; since, if there be any in all creation peculiarly abstruse, this is of them : a proceeding which could not have executed itself. But be that proceeding what it may, it is thus that God has replenished the earth with His vegetable multitudes.

And this earth is a mass of vegetable life. In animals, the fact of replenishment is less visible ; superior as the numbers are, and more numerous too as are the appointed species. The plants display themselves everywhere : they are the universal covering, the dress, of the naked earth : they are that life which would render the inanimate globe all one life, though not an animal existed. Did they not even perform the vast functions with which they have been charged, in reclaiming, extending, and improving the earth, in being the basis of animal life and existence, and in more, their very life and beauty would render the world a place of delight ; as, for this also, were they ordained ; commanded to abound, and commanded to luxuriate in

more than conceivable variety. The abundance and the luxuriance may differ throughout the earth : but there is life everywhere ; everywhere there is beauty, and everywhere there is utility and pleasure. The lofty mountains are clothed as densely as the plains below : if their tenants are less aspiring, they fill the rejected places and cover the hopeless : rendering the bare wall of rock a home for life, and ceasing not, even to the appointed boundary which separates that life from the eternal cold of death. Zones upon zones, from the mountain summit to the plain, and from the pole to the equator, produce their plants, their shrubs, and their trees, increasing in stature and luxuriance and multitudes, as they approach the centre of light and heat ; and, as they attain that, it is a perpetual contest of plants, which shall gain the superiority and occupy the soil. If, in the polar regions, the sun of a day brings out the whole mass of dormant life, to flourish as long as water can flow, it is but the same energy, the same command, which heaps life upon life in the tropical lands. And what Power, what Will but that, could have covered with His life the arid desert, the surface of the waters, and the depths beneath the sea ? who but He, to whom nothing is impossible, who, in creating difficulties, knows also how to conquer them ?

Thus does He command the earth to be filled, and it is filled : thus does He say to His plants, Replenish ye the earth for ever ; and it is for ever replenished. Let the casualties of the earth itself, let seasons, let animals, let man, destroy, consume, change, impede as they may, they shall not cease, they shall not fail anywhere, not for one year ; the blanks shall be filled, the earth shall not remain anywhere destitute of life, nor, anywhere, shall His animals want that which He promised when

He created them. If His rivers form new lands, if His sea quits the shores which He had first appointed for its bounds, if He raises new islands from the deep, and covers oceans with another earth, His plants are still obedient to His orders, and all is clothed, everything is replenished, that all may be full. The earth itself may fail : but He has assured us that while it stands, seedtime and harvest shall not fail ; and His words are confirmed by His works. If the cities of men are deserted or disappear, Nineveh is no longer known amid the world of plants from which it first arose, and the vanished towns of Lydia and Pamphylia and Phrygia have surrendered their foundations to that vegetable life over which man had obtained a brief conquest. If he but leaves his streets for a short summer, he returns to find that vegetation has resumed its rights and its place. Plants cover the walls of his abandoned castles, and even load the roofs above his head ; they fill his imitative lakes and his canals, and incumber his made paths ; causing him to remonstrate against the law which clothes his fields to enrich him. Even his ships cannot sail the sea without being detained by the universality and activity of vegetation : and it pursues him everywhere, in his walls, his vaults, his clothing, his books, his provisions, in everything. It overloads the very plants which he cultivates ; and if it thus penetrates into his domestic intimacies, and assails him in that external world of life which he has selected for himself, so does it multiply to destroy those laborious architectures through which he desires to leave a name behind him, and to triumph over the ocean. Nothing is hidden from its activity, when it penetrates the mine as the vault, and when it has chosen to make a place for itself on the uncertain, the

unstable, and the deadly surface of the eternal mountain snows. This is indeed a perseverance, an obstinacy of vegetation, which, could we assign it to will, would imply an unconquerable determination to succeed in what it desired. But it is will: for it is His will. From the beginning He had determined that the earth should be filled with vegetable life; and His power for ever effects what His benevolence had planned.

CHAPTER XLIII.

ON THE USES OF ANIMALS TO MAN.

IF we are too often unwilling to assign to the beneficence of the Deity the various things we enjoy, this especially happens when we are unable to trace an indisputable appropriation of them to ourselves. We see that they exist independently of us, and, if living beings, that they possess their own enjoyments : whence, perceiving some obvious purpose, we refuse to look at an ulterior one. But if there are more causes than one, for this erroneous judgment, use and familiarity are the most innocent. We receive good so constantly, that we not only forget the giver, but should wonder were it otherwise. Nor is there necessarily any positive impiety in this ; since our feelings are the same with respect to human benefactors, too often neglected in proportion to the perseverance and uniformity of their bounty : it is a possession which is felt as implying a right. Yet a very little reflection will show, that if there can be no right, so this constant reception of benefits is not at all the necessary course of things, and that amid the complications of creation, the chances of wrong and evil, of injury and suffering, were at least equal to those of good ; of exemption from pain and privation, or of enjoyment. The computer of probabilities might find

little difficulty in proving this, were he inclined ; differently as he may have judged without making the trial.

The other apparent cause, deserving no harsh name, however faulty the result, may be sought in our vanity. Deriving the advantages, immediately, through our own knowledge and powers, we consider these acquisitions as the produce of our exertions. Avoiding the usual severe term, ingratitude to God, this is thoughtlessness : it is to forget that these very powers are given by Him, but, still more, to forget that they would have been useless, unless the arrangements of creation had been so made as to enable us to profit by them. There is something also very inconsistent in this vanity. We believe, through its influence, that creation was specially intended for our use : yet this is but a rote of words, if we do not believe in the details as well as in the generality. It is vanity opposing vanity, to believe that we are the authors of our own advantages, after agreeing that they were designed for us by the Creator. If this is not injustice to Him, it is either oblivion or bad reasoning, at least. If there are coincidences, or adaptations, between the things themselves and the powers through which we convert them to profit, while, without such adaptation, that could not occur; then ought we to believe that those adaptations were designed for the very purpose which is attained ; our good. It is the duty therefore of philosophy to correct this faulty reasoning, or, independently of piety, to learn to reason more soundly ; while it is the object of the present and some subsequent chapters, to furnish the demonstrations from which the true conclusion may be drawn. And the result ought at least to be, a rational gratitude for good received, with a conviction of the beneficence of God ; as the ultimate and better

effect must be trusted to something more than the conviction of reason. If a true piety does not require these arguments, it can lose nothing in thus obtaining a confirmation of its feelings : since reason is for ever that fixed point of reference which no vacillation of sentiment or affection can shake or move.

If there is a piety indeed which acknowledges the general reception of benefits, yet will not do so in the details, it is not a sound or a firm one. But there is occasionally something else ; a reflex feeling of pride, attributing to God what we are conscious of in ourselves. The objects are mean, or unfitting for Him to know of, or direct ; or we will not thus associate His name ; or we are averse to confound ideas so widely distant ; forgetting that what we fear thus to contemplate, is often no other than a vague term to which no definite ideas are attached ; far less that which is implied in the words Universal Father. If He created for our use, how is it that He does not also dispose and protect for that use : if He created " all things," how is it that He did not create every individual thing of that all ? Where is it that this universal care stops ? is it when it is to be applied to the intended purpose ? And what is that belief which acknowledges this beneficence and this care in words, yet will not see them in their actual application to human wants ?

But, dropping this view, if, as I believe, we have not discovered the least part of the things intended for our good, the belief that everything was so intended, as its applications were foreseen, will possess a philosophical advantage, in leading to exertion and examination, and thus to further acquisitions : or should it fail in doing this, the effect will still be, to add a specific and a new interest to the investigations which will at least termi-

nate in a more accurate knowledge of Creation. It is that study of design through final causes, which I have already pointed out.

All things were made for man : he is entitled to derive use from everything ; while he has wishes inciting him and powers enabling him to attempt and to succeed. The specific question, in this and the subsequent chapters, is, whether the Creator has not actually given peculiar qualities to many things, and so disposed them, that their uses, with the means of using them, are so distinctly pointed out as if all this had been revealed to him in words ; while if this should appear, then are specific acts of beneficence proved. If further, there are cases where these indications are not equally plain, but that uses have still been derived, such a special intention is probable, at least ; and we are not entitled to reject it, and to appropriate the merit to ourselves. And lastly, being convinced that much remains unknown to us, from which future races of men will derive advantages, we are bound to believe that all these intentions have ever existed in the mind of the Deity, who therefore foresees the future applications of those hidden things : having concealed them in the depths of His counsels, that He might furnish man with a perpetual stimulus to exertion, in that occasional success which will ever lead to fresh researches, and thus also render him progressive in good.

The philosophy and piety of the "heathen" Cicero had seen what too many of his successors have overlooked or denied. "Canum vero tam fida custodia, tamque amans dominorum adulatio, tantumque odium in externos, et tam incredibilis ad investigandum sagacitas narium, tanta alacritas in venando, quid significat aliud, nisi se ad hominum commoditates esse generatos ?"

This is the argument which I am about to extend much further; as I shall commence with the animal creation.

Notwithstanding the questionable wildness of the Camel in Central Asia, as stated by Pallas, natural history, even to this hour, seems to have abandoned the hope of proving that this animal, in either of its kinds, ever existed in a truly wild state. Those mentioned by Desmoulins as wild in the time of Adrian, had probably escaped. Diodorus Siculus indeed says that there "are" wild Camels in Arabia; and if his testimony is that of an eye-witness we ought not to contradict him, whatever may be his inaccuracy as an historian; though were it proved true, it would not affect the essence of the present argument. This animal is known to us now but as the servant and follower of man. The indispensable services which he derives from it are familiar: it is equally known, that without its aid he could not exist in countries which he, now, extensively inhabits; and the unexpected deviations of structure through which itself has been allotted to those, I formerly described. That it kneels to be loaded, without instruction, and that it has a provision on its knees and breast for that purpose, prove that peculiar destination for man's use, which it is needless to urge. If it has been said that these and the hump are the produce of pressure and use, "marks of servitude," how can this be, when the animal is born with them? Did the Creator not intend that the children of Ishmael should trade through the sandy deserts: is there anything of all which man does which was not foreknown, or anything permitted, for which He has not provided?

In spite of much research and much contest, the wild and original state of the Horse is equally unknown. I quote the most recent and sober opinions, divested of

all views of the present nature, in saying that this animal is nowhere wild at this day, except where it appears to have escaped from the domestic state. Was it ever so, any more than the Camel? It is more widely necessary to man, and equally adapted to his wants: I know not why it should not have been created with ~~and~~ for him; essentially domestic, his appointed servant. On what grounds is the reverse determined? Men commence by forming an opinion, and are somewhat surprised when asked to assign the reasons: yet it is thus that knowledge is obstructed, and truth becomes unattainable. Yet were it otherwise, the present argument would not lose a grain in weight, when the temper, dispositions, form, powers, everything, of this first of all animals are considered, with their perfect adaptation to the uses which are derived from it. Its back is that which man would have made for his own use, had he constructed it; the mouth is almost the only one which bears the bit without suffering; it has the only foot, (if I except its congeners) which will endure an additional weight under rapid motion: it is the only wild animal of similar power which is tamed in a few hours; and nothing but an appointed instinct could have thus taught it to submit, and even to rejoice in its rider. How easily it is attached to man and to human society, I need not say: but the proofs must not be sought in our own country; not satisfied unless it gains by severity and force, that which would be voluntarily and cheerfully given to kindness.

The Ass is known in the wild state, but has been domesticated from the earliest times. Through a precision of footing which is even augmented in the mule, it is fitted, almost like the goat, for those mountain difficulties where the horse becomes less serviceable:

while its strength, patience, steadiness, and endurance of privation in food, form a combination of qualities that point to the design which allotted it, another servant to man. If the moral qualities of the Zebra, Quaccha, Dzigettai, and Onager, are such that we have as yet derived no services from them, it is possible that this was not intended; but it must be recollect that the education of generations has a great influence over all animals, and that we have as yet made no attempts on this subject.

Cicero has anticipated all that I could have said respecting the Dog: it is a noble character, as it regards man, and is the more remarkable, when contrasted with its generally unfriendly conduct towards its own races: while, if his conclusion is not just, it would be fruitless to pursue this subject a moment longer. Its original wildness has been the subject of interminable disputes; as those who were resolved that it should be so, although they could not find it, have derived it from the wolf and from the jackal. It was not to have been created for man, with him as for him, his domestic companion and servant. Such has science been, under that hatred of a Deity which it has so often shown: daring to reason, where He was concerned, as it would have been ashamed to do on any other question. But though proved originally wild, as it has not yet been, since that of New Holland may be an escaped follower, the argument would remain as valid in this case as in that of the horse, if admitted to have been once wild. But it is still stronger. There are many kinds of the dog, of distinct powers and intelligences, while the particular services of each kind are needed. These kinds at least were never found wild; and so little is this expected, that the same naturalists pronounce them,

to be varieties, for the purpose of evading the present conclusion ; although thus contradicting their own principles, which will not admit of such extreme, and also permanent variations as occur, in the greyhound and the bulldog for example. But, either way, escape is impossible. If these kinds, being only domestic, are species, they were created, originally, with and for man : if they are but varieties, an exclusive law has been made in his favour, in this race, which renders varieties equivalent to species ; while they are thus rendered numerous, various, and permanent, through a permission given to man, or by the Deity for him ; since they occur nowhere else than in his society and under his care.

Beyond this we do not trace the same definite appropriations ; though there are gradations of proof or probability, consisting in extreme remoteness of domestication, or in a powerful instinct of submission to man, when these proofs are strongest. The Ox stands foremost, as a patient and powerful labourer ; most remotely domesticated, gentle and docile, though with great means of rebellion and offence, and, in its female, supplying abundance of animal food, without suffering. Deprive man of this animal, the dog, and the horse, and he could not maintain his position in the world for a year : he never could have attained the one which he holds, nor could he discover a compensation : while this is argument enough for all these appropriations, since man was not created to remain in the savage state.

The Buffalo has demanded more attention and more compulsion : the Reindeer offers a case analogous to the Camel : it has enabled man to inhabit large territories which must otherwise have been untenantable by him. The gentle and docile Llama, and the Elephant, require only to be named ; though, in the latter, we are

bound to remark the unexpected facility of domestication, in an animal which is for ever to be reclaimed from the forest, together with the remarkable powers of intellect which it exerts in our service. The domesticity of the Cat resembles that of the dog, if its services are of less moment; while in this case also, it is by no means proved that it is known in the wild state, since naturalists seem to determine that the wild cat is a different species.

We pass gradually out of the list of these more perfect servants, as we proceed; but it may be questioned whether the fault does not rather lie with us than with them. In many of the preceding cases, where no absolute allotment, like that of the Dog, has been made, we have procured a domestic progeny by a succession of cares: in the following ones, we have not yet made the attempt on the first posterity. We press a wild animal into our service, and when it dies we replace it from the forest or the free air: as, in other cases, we rather suffer, than labour for, a state of semidomestication; having no right therefore to decide that a more complete one was impossible.

The Ferret holds an intermediate position between the last and the present list. The Cheetaw is a perfect example of a wild, compelled, servant, whose further domestication has been neglected; we do not know the extent of service which it might afford. The use of the Otter has been often experienced, yet it is even more neglected: and if the utility of the Cormorant for the same purposes has rendered it a valuable servant in China, it is one which remains confined to that industrious people. Feudal fashions, with an aristocratical love of distinction, added to the instinct of the chase, produced us the Falcon, as the same causes have led to

the same practice in the East: but we still seek a successor among the wild progeny of the mountain, and expend our labour on what is not always reclaimed. And to terminate a list, of which the brevity should excite surprise, we receive from the decoy Duck instinctive and voluntary services, yet neglect to enquire whether we might not extend those far more widely, by the education or the domestication of the same, or of other analogous animals.

Such is the catalogue of our labouring servants: it remains to inquire of those which, under similar domestication, supply us with accessible and secure food and clothing: though I may omit those already noticed as labourers, however serviceable to us in this manner also.

The Sheep has given rise to the same disputes as the dog: it has been derived from the Argali and the Moufflon; but the question remains undetermined; and if it has no wild progenitor, we must infer of it as respecting the Camel. But if its uses are familiar, here we must also note the power of varying its properties by culture; since, in every case, both of plants and animals, this very permission bespeaks the intended destination. The Goat, on the contrary, abounding in the wild state, has been domesticated from the most distant times, while, like the sheep, producing permanently useful varieties. And the Hog, of similar wild origin, terminates this assuredly brief list of the quadrupeds domesticated for the purposes of food and clothing; unless we add the imprisoned, rather than domesticated, Rabbit and Fallow-deer. Of the Llama and Vicuna, I need only notice the very limited uses under this head.

The number of birds domesticated for food is also

very small ; yet there are circumstances in these which appear to mark original laws directed to our use, and which might probably be made subservient to a much wider utility. All of these, however, are found wild : there is no case analogous to that of the Camel. Possessing such powers of motion and escape as they do, it is difficult to perceive how they should ever consent to remain with us, unless they have received some command for that purpose, as the Dog has ; though the object and the mode differ, as it operates also through some different provision or provisions. And if even climate here ceases, in some cases, to be a source of limitation, it seems a safe inference, that the intention was directed to us ; as we are enabled also to do for ourselves, what the animal would not have undertaken of its own accord. It is the argument which might equally have been used in the case of the Horse ; which, but for our sakes, need not have endured the extremities of climate, more than the Lion.

In this class, the domestic Fowl, the Goose, and the Duck, may represent the Ox and the Sheep among the quadrupeds ; as may the Peacock, the Pintado, and the Turkey. The Pheasant, like the Rabbit, holds a sort of intermediate state between wildness and domesticity ; yet there seems nothing to prevent it from being what the former are, except want of desire or of industry on our own parts. The Pigeon, derived from a wild species still abundant among us, offers a remarkable instance of domestication, united with absolute practical liberty, under uninjured physical powers. The rare Muscovy duck, as it is termed, and the more rare Canadian goose, will probably serve to indicate that such tractable kinds exist far more widely than we yet know. The vivacious and wandering Teal is domestic among a

people that we have not chosen to imitate ; and a little care might, with us, render the Sheldrake what the wild duck is, whenever we choose to try ; a domestic bird, fully able to quit us, yet choosing to remain, as the goose also does, under uninjured powers of flight ; free and powerful as the pigeon, and not less attached.

We derive similar advantages from that principle of local attachment which I shall immediately examine, in some cases where there is no domestication ; where the birds continue, to all purposes, wild. In the Rook and the Heron, the value may be nothing : in the Pheasants and Partridges of our preserves, the utility is similar to that in the case of the Rabbit and its warren : it is an advantage which even the Fallow-deer does not afford : they are voluntary prisoners, though to a wide range : as are also the Grouse and the Stag, though demanding one still more extensive. The wild mountain Sheep is often little more under our command, since it must be almost hunted by dogs ; and thus does the Goat, even more frequently, stand on the very boundary between the wild and the domesticated conditions. Of the domesticity of the fishes, we only know, now, that it is necessarily compulsory, from the nature of these animals : it is possible that anything beyond this is out of our power.

It cannot be inferred that there are any instincts or appointments through which any of the insects are directed to be useful to us. Wild or domestic, we apply themselves or their productions to our own advantage, as we do those of vegetables : beneficent intentions may be equally inferred, but not under the same arrangements as in the preceding cases. The domestic Bee might indeed, in practice, be compared to the Pigeon ; but the essential circumstances have no resem-

blance to each other. The Cochineal fly we cultivate as we do corn. The taming of individual flies and spiders implies indeed a power of domestication ; as the sufferance or recognition of bees for particular individuals does, and as perhaps does the natural tameness of the Papilio cardui : but in this, even were it far more extensive, we can perceive no utility.

Whether or not it is believed that the Creator has given dispositions and constitutions to any animals for the purpose of rendering them more serviceable to us, no inquiry has been attempted on this subject. The opposers of such final causes could not inquire, in conformity to their systems : and the naturalists who have not opposed that doctrine, have forgotten this, with everything else which relates to God's moral government over the animal world. Yet He acts by means of agents : and if those can be shown, they will prove that intention, the design in question, which could, otherwise, have been only inferred through the *à priori* reasoning.

If personal attachment to man is one of the implanted instincts for this end, the dog is the example as undisputed as it is perfect. It is the instinct of an entire race ; while there is often a select attachment, added to the general tendency towards mankind. It is true, that all man's associates are susceptible of such individual attachments, not only down to the bird, but to the very insect ; though we are unable to conjecture the cause, since it does not always arise from feeding or from kindness, as, in the Dog, it is notedly independent of both. In this animal, the instinct in question alone suffices ; but in the rest, it seems to act in combination with others, as there are also efficient causes of domesticity entirely independent of it. In the Camel,

there appears a desire towards man, without any marks of peculiar attachment; but we are not well informed respecting this animal: it is probable that an indolence of character, or stupidity, producing submission, confirmed by habit, is an efficient cause; though the readiness to kneel to him proves that this obedience is an implanted instinct for his service. Nor is there any other case, even that of the Horse, in which we can allow much effect to a marked principle of attachment; however that may occasionally appear. That it can be produced, however, even in a purely wild animal, we know by the instance of the Elephant; while, wherever it does occur, it may be, even as in the Dog, though in a less marked manner, the proof of a neglected and applicable instinct pervading a whole race.

I may unite sufferance with indolence of character, and with what may be termed stupidity; since, neither the metaphysical distinctions, nor the immediate causes of the visible results, are always very clear: as habit alone might also be considered a cause of sufferance. In the Horse, as in the Camel, there is perhaps more of sufferance than attachment: it appears the same in many other animals of a mild character: as, wherever it occurs, it is a quality of which we can take advantage, as has been done in the case of the reindeer. This is tameness, in a negative sense: that of animals is sometimes of a very different nature. In the sheep, the character of the tameness seems the same: it is careless or indifferent about man; while under that cultivation which destroys the original activity, this sufferance becomes indolence, or, at length, stupidity. How much the characters of animals differ in respect to intellect, it is scarcely necessary to point out; this is visible in species, as well as in genera; and it is familiar

in the case of dogs, not only in varieties, but in individuals. The descent in intellect from the poodle, or the shepherd's dog, down to the bottom of the scale in the hopeless pug, is known to every one. The stupidity of the Ox appears to be the appointed aid of that utility to man which consists in its strength: it is the quality which neutralizes its inseparable powers of resistance and offence. The indolence, or similar stupidity, in the Cow, renders it one of our most useful servants, in another manner; having no thought but to eat, and to ruminate, with as little exertion as possible: while the Turkey perhaps affords the most perfect example of this quality of mind, as it seems also one of the chief sources of its domestication. In a very different department, in which however we have no concern, the Aphis seems to confirm the belief that this character has been given for the very purposes which are effected by it. In voracity, indolence, stupidity, and abundance of secretion, all its qualities are those of the cow; while its destination to the use of the ant is the same as that of this animal is to us. Nor do I doubt that the domestication of the servile Ant by its more powerful congener, is the result of some instinct appointed for a purpose; though we do not perceive what that is.

There is an indolence however which seems to belong to physical arrangements, to feebleness of muscular power, and which is one of the causes facilitating domestication, as it has with equal probability been appointed for this purpose; the intended services being to supply food, not labour. The indolence of the Ox is a mental quality, and it can be roused to exert its required strength: that of the Turkey, is the disability arising from great weight, united to feeble muscular powers; while the addition of an indolent and stupid

character renders the contrivance perfect. Thus has the common fowl been made a bird of weak flight, with the same result, and doubtless for the same purpose ; though other causes may aid the facility of domesticating this and many other animals. And the provision itself is visible, in the whiteness of the pectoral muscles in both of those birds ; added to a shortness of wing which is a cause of great labour. In the natural state, the flight of all the gallinaceous birds indeed is controlled by the form and size of the wings, even when the pectoral muscles are brown ; and hence short flights, though they should be powerful ; being one of the causes which, added to local attachments, prevents the wild ones, such as the Pheasant, the Partridge, and the Grouse, from wandering far. Hence also the probability that we might render the whole of this race as domestic as the common fowl ; since, in the natural state, the resemblance in character and powers is absolute : while the other causes of domestication might also be brought to act, for this purpose.

Of those, one of the most efficacious cannot be considered an original appointment, in the same rigid sense : it is the disability which is produced by ourselves, through cultivation. Where that was originally assigned, the additional weakness becomes such as to destroy the powers of flight altogether, as in our purely domestic fowls very generally ; and they would thus be our prisoners, were there no other cause, as those also act more easily, since there is nothing to be counteracted. In these cases, increase of bulk and weight aids the effect which is commenced by want of exercise ; as there originally ceases to be a desire for flight, under the security of food : so little are animals inclined to labour, under any other motive, whatever we may have

imagined on this subject. Under this domestication also, it is not only the individual animal that becomes changed, since that change is propagated to its posterity: so that the progeny is disabled, from the birth, under a production of permanent varieties; while the mental characters of those become also quite different from that of the original parents. All this is familiar in our domestic birds, where it is also most remarkable, in consequence of their peculiar powers: but it is not less true of the quadrupeds that are not used for labour; as it is a common fact in some breeds of sheep, and is the character of all the varieties of the hog, compared with the lively and active animal from which those are descended.

There is another source of the association of animals with us, the very reverse of what I have thus pointed out. This is defiance, or courage; and it is rendered effective for our purposes, by some of the other causes. It appears one of the sources of domesticity in the common Fowl; and is extremely remarkable in the game cock, where the tameness and the courage hold an exact parallel. In the pugnacious and tyrannical Robin, the same defiance produces its well-known familiarity. In the Falcon tribe, it seems equally the cause of such domestication as they undergo. And it produces the same effect in the Hare and the Squirrel: the former being among the boldest of animals, much as its character has been misapprehended. It is equally the apparent cause of the facility with which the Spider is tamed; as the same holds in the Crab, which is among the most fierce of the animal races. How far we might derive any advantage from this character, where it exists, cannot be known till we are better acquainted with the moral nature of the several animals; but it is

evident that it would assist in the domestication of the Pheasant and the pugnacious tribe of Tetras. But unless these causes are investigated, as I am here attempting, there can be no grounds on which to proceed ; while I may finish this sketch by pointing out the last source of domestication which appears at present to be assignable.

This is the instinct of local attachment, so largely used in producing all the limitations of animals ; as I have had occasion to make some further remarks on it under that subject (c. 53.) How powerful a feeling it often is, I need not here say ; as the utterly inexplicable, and almost incredible demonstrations of it in many animals, returning by unknown roads to their homes, are universally familiar. I presume we must not say that this instinct was given for the purpose of facilitating domestication, seeing its primary utility in conduced to the limitations of animals : yet I know not why that conclusion should be refused, when, all through creation, many effects are attained by the appointment of one cause. The atmosphere is designed for respiration, but it is the equal cause of many other not less important effects. Under any view however, it is the principle of home ; and it is our business to create this home. I doubt not also that it is among the most efficacious of all the sources of domesticity ; since it is that one through which we principally attach the progeny to the place of the parents : habit acting here, as it does in many other cases. In the Pigeon, this seems to be the only cause of that attachment which is equivalent in value to the inability of the Turkey. It continues free and powerful, does not require feeding to retain it, and enters into no familiarities with us, seldom indeed enduring us more than its wild fraternity of the cliffs.

This brings back the equally free and untamed Goose, every night, to that home where it neither expects nor finds food; and thus also, still more powerfully, does it recall the tribes of the Ducks from the northern ocean to the well-known marsh.

To say how the certainty and regularity of food act in this case, is superfluous, while it cannot also be viewed as one of the appointments for this end. But I must terminate this sketch by observing, that the actual domesticity does not often depend on a single cause. Home, indolence, stupidity, courage, sufferance, unite, in different degrees and modes, to produce the effect; while the presence of food, and habit, aid them all. But as the progeny is concerned, the power of education must also be added; as, of this power over the moral and intellectual faculties, there can be as little doubt as of its effect in permanently altering their forms. We produce moral varieties, as we generate physical ones: while I need not here renew a difficult question, which I formerly examined as much as our knowledge seems to permit at present (c. 21). Be the causes, or the mode of action, what they may, the facts, in this case, are indisputable: the progeny of the domesticated parent is more tractable than that of the wild one, and the successive progenies, under domesticity, gradually attain the utmost condition in this respect which their several characters permit. Hence follows the necessity of labour, in addition to that of observation and trial, under the grounds already suggested, if it is our desire to profit by what the Creator has done for us, under the never rescinded, and never to be rescinded law. Whether we have neglected these offered advantages or not, it will not require much examination to show: and I am thus led to inquire

somewhat further into our power of extracting more wide uses from the living services of the animal creation. In this also I must extend the inquiry to climate, hitherto deemed an almost insuperable obstacle to any further attempts at domestication, where the change must be made from a warm to a colder one ; and it thus becomes a continuation of that one respecting plants which was sketched in the last chapter.

We cannot but be struck at observing that the far greater number of our domesticated animals have belonged to man from the most remote times. The pious philosopher will consider this a sufficient proof of the views held out in this place : but it proves little also in favour of our own industry. It is only in the birds that we have made any additions : yet even here, it is to the active and enlightened Romans that we owe the common Fowl, the Peacock, the Pintado, and the Pheasant ; as the domestic Duck and Goose and Swan are of not less antiquity, whatever people may claim the merit. If the Turkey is our own, we may almost say that it has forced itself upon us. This is all that we have done, with the entire command of the world, with a knowledge of its territories more than doubling what was known to Rome, with a knowledge of animals a hundred times greater, and with a commerce to which hers does not bear the most remote comparison. It may be doubted whether we should have possessed the common Fowl but through her gift ; and still more so, when we have suffered to fall into oblivion much of a useful domestication, which was familiar to that people from their earliest days, while even so ignorant of it as to doubt or deny what scholars read without noting.

We cannot suppose that the intentions of the Creator on this subject were exhausted at the first, or at any

subsequent period : it is proved that they were not, by the additions which we have made, few as those are : but it is much more fully evinced by our numerous acquisitions in cultivated plants, as it is still more strongly, by that perpetual succession of new discoveries which forms a demonstrable portion of the order of Creation and of the Divine government as to man. He admits much that He does not force, but the gift is the appointed reward of industry. If a further extension of our domestic command over animals is impossible, there are none remaining in the world which are inclined to attach themselves to man, or willing to endure, or ready to defy him ; none that are indolent or stupid, none possessed of the instinct of local affection, and none capable of being educated into sufferance, tame-ness, domestic attachments, or inability. Or else there is no animal in existence, from which we could extract further uses through domestication. Neither of these conclusions will probably be made : and if not, the only solution must be sought in our want of industry, and in our vanity, refusing to admit any imperfection in our present knowledge, when the proposal to improve is made ; though admitting, in speculation, that a long career is still open before us. Vain in the new attainment, this weak passion refuses to grant that all is not attained ; forgetting that but for the counteractions which it experiences, man might now have been the savage of New Holland ; not less vain of his knowledge also, than the philosopher : the vilest of animals. We seek at least for difficulties, because the love of excuses is a part of that vanity, ever predominant in the most ignorant and the weakest minds.

The most frequently stated of those excuses relates to climate, when it is proposed to transfer those of a

hot region to a colder one. There is no experience to prove the impossibility of adapting the constitutions of animals to every climate : while, on the contrary, there is much experience of the facility. The Horse, the Ass, the Dog, the Ox, the Sheep, the Goat, the Hog, the Wolf, the Fox, the Bear, the Rat, the Hare, exist in all climates ; the Tiger, in Nepaul, lives on the very border of endless snow, as we have abundant proof that the Elephant and Rhinoceros once inhabited the coldest regions of Asia : and among birds, the Ducks, the Crows, the Snipe, and many more, seem equally universal : while if some of this diffusion is the work of nature, the rest is of our own doing. There is no reason to infer that these are the only exceptions, when the trials have not been made. It is no trial to bring a caged and stoved animal from a hot climate, and then to decide that it cannot live out of a stove ; nor can there be any trial, unless it be made on a progeny educated in a more hardy manner. Man himself, enduring all climates, cannot be suddenly transferred in this manner, without suffering, even when he has been but the temporary resident of a hot one. When it is said that he can clothe himself according to the climate, it is forgotten that nature does this for the animals, under those differences of residence and under those changes : as this also points to a design for rendering them more universal than they originally were. For what other purpose can so singular and inexplicable a provision have been made ? Physiology knows also that the warm-blooded animals produce heat in proportion to the demand for it : the law may not indeed have been made for this purpose, but it is still conducive to the same end. Nor is it an answer to say, that the larger proportion of animals have been limited to climates by nature. They were

placed under a particular distribution, for the great purpose of order, through limitations ; and they have no inducement to quit the places of their food and their habits. But it is nowhere indicated that man is not to change that distribution. I have, on the contrary, shown in a future chapter, (c. 54.) that this is the intention, and that provisions have been made for that purpose : it is a portion of the total plan for the government of the animated world, and, most especially, as man is concerned.

These are answers, derived partly from facts, and partly through inferences from the apparent intentions of Providence, as these are discoverable from other proceedings. But those which relate to some of the translated birds are especially strong. If the Peacock, the Pintado, and the common fowl, are natives of the hottest climates of the earth, there is no apparent reason why every bird from the same regions should not be naturalizable. The far higher heat-making powers of this race ought also to increase the facility ; while their clothing is especially impenetrable to cold. The insects of the hot regions at least, have proved their powers of endurance, unfortunately for us, as far as they have been imported : if we cannot cultivate the Cochineal, it is because we cannot naturalize its food ; and we refuse the Silkworm, merely because we cannot raise that food of such a quality as to obtain a valuable produce.

In whatever manner the domestication of animals shall be extended, whether by breaking up the present limitations of climate, or in any possibly more easy manner, it is easy to see what the increase of advantages would be. Services, food, and clothing are the present ones : it would be to command those in greater variety, and, in the two latter, to obtain with certainty, and on

easy terms, much that is now precarious and costly. I need not suggest the new services which might be conjectured, in addition to some which I have already hinted at; but when inclined to doubt this, it must not be forgotten that had we decided from our own experience, and been ignorant of what others had done, the uses of the Elephant and the Rein-deer would have appeared fables, and things unattainable. We already know the enormous increase of our animal food through domestication: the difference between the conditions of hunting and pasturage form a schoolboy's thesis. If the Thibet goat had been hunted for its wool, like the Beaver, it might long since have been exterminated. Had man destroyed the Sheep for its produce, instead of domesticating it? Yet we are now acting like savage man. Why might not the Beaver, as well as the sheep, be domesticated?

I know not why the command of variety, as well as of abundance, should not be attempted in the same manner: but whether or not, there is one kind of utility depending on this practice, which ought to be obvious without statement; though little belonging to this subject appears to have been so. It seems even forgotten that we feed on grass through the intervention of the Cow; to us, a mere chemical laboratory converting that into milk. But for the Rein-deer, the lichen of Lapland would have been a useless vegetable in the world: it is now the similar food of man, in the same manner. The Hog, the Duck, and more of our servants, are the same laboratories, to convert waste and pernicious matters to use for us: returning to us, with advantage, our own waste and the waste of nature. Without that service, all this would be lost, and man would be restricted in proportion. Providence did not

create these economists of His fragments without a meaning : but it is our business to second those intentions. Why else was the goat created to feed on poisons ? Those poisons were required for other services ; but the superfluity was not to be wasted. If the Turtle converts the worthless fucus into human food, why might it not be to us as the Hog ; or, at least, have we no unoccupied waste in the world of plants and animals about us, and is there no animal remaining in creation that we could press into this service ?

There is sufficient demerit in not advancing ; there is much more in retrograding. I have already alluded to Rome, on this subject ; and I have proved in another work, our power of transferring the fishes of the sea to fresh water, to a far greater extent than they had done ; profitable as this kind of cultivation was to them, and as it also is at present to the Chinese. This is, or rather it might be, a system of domestication for the widest wandering of the animal races, and with corresponding advantages. It is the warren of the Rabbit and the park of Deer : admitting of feeding, allowing of selection, and always under command, with the least possible labour. And it would be the saving of waste, in wasted territory, unproductive water, the waste of unconsumed aquatic food ; and in that negative waste which does not perceive, that the Creator's system of feeding consists in crowding together numbers under variety, so as to produce a concatenated succession of food for the multitudes under His own management. But the usual combination of ignorance and vanity has asserted that the fishes of the sea could not live in fresh waters, and must therefore continue to refuse the demonstrations of the untruth.

If the proofs of the Creator's carefully planned

beneficence in appropriating animals to man, under dispositions implanted for that end, must have long since appeared satisfactory, so should it now be seen, that these intentions continue very largely unfulfilled. It will be for a wiser and more industrious posterity to proceed; while the possibility and the means are here indicated. The preparations may be sometimes remote, and little marked; but this also is consistent with the mode and objects of the Divine government. To have given everything without labour, would have been to leave man what he ever is where his wants are too fully and too easily supplied. The wider conclusion that follows from these views, will be found in the future chapter which treats of the balances of the animal world.

That we obey the will of the Creator in exerting ourselves to profit by His bounty, will not be questioned by a sane piety. But we must remember that the good which we receive by the services of the animal world, is not a tax on their own enjoyments. This is not the character of the Divine beneficence. On the contrary, we can thus derive no good from them, without returning it, nor increase our own enjoyments, without augmenting the sum of their happiness. Increasing numbers through domestication, we multiply the individuals enjoying life: augmenting the produce of the soil through their means, and though for our own interests, primarily for their uses: while also knowing that their chief, almost their sole happiness, consists in an ample supply of food. Thus also do we protect them from other casualties than famine; from accidents, and from their enemies: while the evils they suffer for us bear no proportion to the good. If the servant is occasionally overtoiled, not often so when the

punishment must fall on ourselves, there is no recollection of yesterday's evils nor anticipation of the morrow's, and there is no mental suffering: the especial bitterness of man's lot is unknown to them. The death which we must inflict, produces new lives and fresher enjoyments, while less grievous than that which the beast of prey or the gradual extinction of powers would cause: and what is death, where there is neither moral retrospect nor anticipation?

I need not pursue this chapter further. The uses which we derive from the produce of animals are numerous, and, in most instances, we can trace designs for our use; above all, when these products are useless to themselves. But I need not give a list of what recollection will easily supply: while the mode of reasoning adopted in the following chapter may be applied to the several cases under the present division of nature.

CHAPTER XLIV.

ON THE USES OF VEGETABLE SUBSTANCES TO MAN.

I MAY now turn to some of those objects in the vegetable creation whence man derives benefits and uses, that we may endeavour to see whether, here also, special acts of beneficence to him were not intended. And the general train of reasoning is the same. Is there not something remarkable in the nature and in the variety of those productions ; do they all follow the general laws of vegetation, or, on the contrary, do there not seem to be specific laws, or exceptions ? Are not many of these substances peculiarly fitted for the wants of man, and often for very indispensable, and very singular ones ; while so purposeless in all other respects, that but for him they need not have existed ? Did we not long desire many such things before we knew of their existence : were we not delighted with the discovery : were they not exactly what we would have made for ourselves had we known how to compass it : have not our wishes been fulfilled, and our wants supplied, in the most exact, and often in the most un hoped-for manner : and are we not still wishing and seeking for other, similarly peculiar things, that we may accomplish other peculiar purposes ; while even now, almost annually, something new and useful does come to light, as we

cannot doubt that many more will be discovered ? If all this be true, then are we bound to believe that the Creator did make all these things, knowing their properties, knowing the uses to which man would apply them, and intending them for those uses. Which is beneficence. Everything at least which is not absolutely necessary to his existence ought to be judged in this manner ; above all, when it is without any positive utility, and simply conducive to his pleasure.

Limiting this chapter as I have done, I can but hint at the uses which man derives from certain properties of living plants in such cases as the Tamarind and the Banyan tree, and, above all, in the Adansonias, where the exceeding peculiarities in the forms, foliage, and mode of growth, can leave no doubt in any reasonable mind, that they were constructed and appointed for the very purposes which they serve in a burning climate. These matters, and more, I must trust to him whom I have here attempted to direct into the right path for the study of creation ; and at this stage of such a work he ought no longer to be at a loss. I must here take a more partial view of an extensive subject.

I have elsewhere alluded to the strange and unexpected variety of woods which have been produced under one general organization, and one chemical compound very slightly varied. This, sufficiently wonderful in itself, is still more deserving of remark, when we see the very different uses which those serve, and know that these depend on such specific properties, so strangely and unexpectedly given. If some of those properties indeed may be deemed to conduce rather to pleasure than utility, there are others with which we should find it very difficult to dispense, or which, being irreplaceable, evil consequences of great extent

would ensue from the loss of the woods to which they belong : while, in either case, the moral inference is the same.

This is true of the Fir tribe, so peculiarly fitted to a purpose bearing deeply on the moral and political condition of man, namely, the masting of ships. Straightness, longitudinal tenacity, and levity, with a limited elasticity added to a small flexibility, was the combination required ; and it exists : it is a case somewhat analogous to that of the feathers of birds. Nor is it this in the merely exterior and obvious arrangement ; since, in the interior anatomical structure, the contrivance is similar, as it is confined to the trees of this peculiar family. The strong and hard portion of the annual cylinder resembles the quill part of the feather, and the spongy lamina serves to extend the diameter of the total mass without adding proportionally to the weight ; thus producing the greatest transverse strength with the least quantity of materials, under the same mathematical principle. We do not indeed know all the woods in the world, and there may be many substitutes : but let them occur where they may, the principle must be the same. It is further remarkable, that this combination of properties should have been united to an erect simple form, of great length ; while we also perceive that a provision has been made for this, not only in the anatomical structure, but in a crowded growth and in the decay of the lateral branches. The doctrine of probabilities may inquire what were the chances in favour of all this, if there was no design. Many other trees include one or more of those properties, but none unite the whole. The Poplar is tall and straight, but it wastes itself in branches, and wants

longitudinal tenacity. The Lime possesses levity, but is deficient in all else: and thus through a catalogue which I need not here examine.

It may be thought fanciful to say, that the forms of the Lime and the Beech similarly correspond to the qualities of those woods and the uses for which they were destined. Yet we can at least see, that the shape and growth of the Fir would here have been useless, for want of a corresponding internal texture. Be this as it may, the turner here finds useful properties, under different degrees of strength and levity. In these and some other woods, knowing that the vessels of plants are longitudinal, we might have expected the same difference between the longitudinal and the lateral tenacity, as in the Fir: but there is a special arrangement, in the nature of an exception; and wherefore was this at least not intended, and for the very uses that are thus attained? The Beech may be wrought, almost as if it was a block of stone; and if the arts well know the value of this peculiar tenacity and structure, so do they scarcely know where else they could have found cogs for millwork, and the naves of wheels.

We find a longitudinal texture once more in the Ash, yet under a new combination, and, especially, a power of elasticity so unexpected, that its extent is but a recent discovery. Nor would the longitudinal tenacity of this wood have given us a substitute for the Fir: the weight is too great, and so are the flexibility and the elasticity. Yet thence the toughness so valuable: the greatest strength in the precise manner required, without undue weight; and no lateral tenacity where that was not needed. The Ash splits willingly; but it is not a small effort which is required to break it trans-

versely. It is perfect for its uses : while its flexibility is united to an elasticity resembling that of steel, but even more valuable, since it cannot be wearied.

If I compare these examples of longitudinal tenacity with that of the Acacia (*Robinia pseudacacia*), here is strength, as in the Ash, but without the same flexibility and elasticity : hard and unyielding, like metal, it is a bolt for securing the planks of ships; among the best of treenails. Reversely, the same texture and tenacity in the Yew, are attended by an elasticity more active than that of the Ash, the utility and application of which are well known. In the Oak, lateral and longitudinal strength are singularly united, and combined with other well-known qualities which render it the especial timber for ships. In the pencil Cedar, (*a Juniperus*), a longitudinal texture, with considerable inflexibility, but without much strength, is united to softness, in such a manner, that we cannot easily find a substitute, for the same uses. Those may indeed be trifling, but the adaptation is perfect. It is not less so under a contrast, which I note, because thus the impression of design or intention may be stronger. The general organization and chemical constitution of all woods are the same, the plants are nourished by the same food, they grow in the same soil, and often in absolute proximity. Yet so unrestrained is the hand of Power, that it gives us, in *Lignum vitæ*, a combination of strength, toughness, hardness, and resistance to friction, which scarcely even the metals furnish, although there, if anywhere, we naturally look for those qualities. I cannot however proceed further on this branch of the present chapter ; yet may point out those well-known combinations of qualities, which render the Elder and the Euonymus like the Acacia ; with those

in the Box and Pear tree, without which we might have wanted the valuable art of engraving on wood. Thus does the Iron-wood furnish a weapon to the savage who is ignorant of iron. And if I pass over the merely ornamental woods, we may at least admire, in them, that variety and beauty which pervade all nature.

Turning from the mechanical qualities of these productions, I must notice certain chemical properties found in them, which are not less remarkable than difficult of explanation, and which are sometimes of singular use. The differences in their resistance to the united powers of air and water were sufficiently inexplicable ; but still more so is their property of apparently endless durability when buried in moist earth. But for experience, it would not have been believed. Yet without this, we could not have built on those wet and loose soils, which, from their peculiar fertility, are, everywhere, as they have ever been, the chosen seats of population : without this, we could scarcely have constructed high-roads across rivers ; without this, we could not have founded piers and made harbours ; as even Holland itself might still have been at the bottom of the sea. These are great ends in the plans of Providence, if He has any plans : and assuredly the means, unexpected as they are inexplicable, could not but have been appointed for them.

It is equally impossible to account for the various powers of combustibility, or modes of combustion, in different woods. Though all equally formed of a material essentially combustible, and presenting, whether in their density or aught else, nothing by which we could anticipate such a judgment, we find that independently of resins contained, some flame with facility and burn rapidly, while others are slow, or

refuse to flame, or may almost be called incombustible, so much management does it require to continue in them that which has been commenced. If we have hitherto derived little advantage from this last quality, posterity may yet learn to profit by what we have neglected. In another manner, there is in the Teak, a peculiar property, of high value, which we can only refer to chemical constitution, though ignorant what that can be. This tree, and the Oak, the one allotted to hot climates and the other to temperate ones, while the one ceases to grow where the other commences, seem to have been destined as materials for ships, to remain without rivals. Each also is possessed of peculiar durability, in addition to its other qualities; but even more has been done for the Teak, as if, without this, in a climate so abounding in one peculiar cause of destruction, it could not have been guarded for its appointed uses. It is exempted from the attacks of those peculiar animals to which the destruction of wood has been so largely entrusted, for ends valuable to the vegetable creation as to themselves.

That singular plant, the Bamboo, is scarcely less the friend of man, where it grows, than the dog among animals or iron among the minerals: convertible to ends without number, while also appearing to have been formed for every one of those. Tenacious, tough, light, strong, in material, it has also been disposed, like the quill of a feather, in the mathematical form of strength. And, as if intended for the use of savage man, as yet without knowledge or tools, it is ready wrought to his hands, symmetrical, and even ornamental; planed, turned, filleted, polished, varnished. Thus is it a beam, a plank, a pillar, a mast, a yard, a floor, a fence, a house, a pipe, a bottle, a cup, a kettle, a musical instrument, and even an article of food: while

its wonderful profusion and rapidity of growth render it an inexhaustible resource, for every purpose. In no condition could man have overlooked what was thus prepared for him: and if the Bamboo was not, then is there nothing of which we can assume this, from the cotton by which he is clothed to the rice by which he is fed. And, like the fruits which demand no cultivation, this ready-wrought material seems to have been appointed to situations where man was yet new in the world, or where he was destined to increase as an uninstructed being: though with those countervailing evil effects, on which I remarked in speaking of those productions, equally proving that his powers were ordained to be elicited by labour, through wants and desires. In the same manner have the Cocoa-nut and the Gourds been constructed for his vessels, of various services; and how could he overlook that which offers itself ready made to his hand?—a work of art executed by nature, which he might imitate, but cannot easily excel.

Proceeding to another set of uses from vegetable substances, I may again take man in his savage state; and, if finding that what exists has also been pointed out, so that he can neither overlook it nor mistake its applications, I may conclude that, like iron, it was made for him, and, like the Dog, has even solicited him, for his own good. Still more, if the same useful substance occurs in every part of the globe, yet in different plants, because to each climate its plant has been assigned, must we not still more believe in the design for the use, and in the beneficence which has contrived that what was so necessary should be wanting nowhere? except as man has quitted the regions assigned to him, and must therefore endure the inconveniences which he has provoked.

Not only have the fibres of the Cocoa-nut been prepared that he might find cordage, but they are so palpable that he cannot overlook them. If that were possible, the Rattan is a cord ready made for him, and its parallels are widely spread, even to our own Willows and Heaths. If he has not the Cocoa, the fibres of the Aloe are before him: he needs not even search for them, since they are ordained to leave the plant, of themselves, soliciting his hand. In other lands, he finds a grass, a rush, which he cannot attempt to pluck, without perceiving that he has gained a valuable servant: and, under more attention, similar indications of toughness have led him to greater discoveries, waiting only for the expansion of his intellect and the increase of his desires, to produce all that Flax has effected for him. No one could have expected such strength in a plant so apparently tender, so feeble, and so insignificant: and did not He who arranged the parallel fibres of its bark, adding to strength, delicacy, fairness, and brilliancy, also ordain, that, like Wheat, it should find a climate far and wide, from Egypt even to the frozen Baltic; a climate extensive as its uses and value? Nor can we look at Hemp, nor reflect on the great moral and political uses with which, like iron and coal, it is inseparably united, without believing that it was created for our use, though, unlike the Cocoa and the Aloe, reserved for man in a state of improvement; perhaps, like much more, to preserve the stimulus and the rewards to industry, and to continue the progressive melioration of society. In Cotton, reversely, we find an extremely obvious substance; yet, like Hemp, not fitted for uncultivated man: while its adaptation to the inhabitant of the climates where it grows, has not confined its use to those countries. It

has become one of the greatest engines of commerce and industry which the world affords : a source of power and of moral and political effects so enormous, independently of its absolute uses, that we must look on it as one of those great hinges ordained by the Creator, upon which man's condition in the world was to turn.

On the other hand, we find in the Paper Mulberry a singular clothing, almost ready prepared for man in his savage state, as the Bamboo has been ordained for his dwelling, and the Talipot to shelter him from the rains. And this singular tree has also been given by Providence to islands of an origin so peculiar and recent, that none of the animals which furnish him with clothing could have existed in them, except through a system of creation which He has not thought fit to adopt. Here too, the facility of the discovery is such, that the application could scarcely have been overlooked. Has it not even been pointed out ? If not here, surely at least it has been done in the hair of the Gomuti palm ; and why also not believe that this was as expressly created for man as it is revealed : that its hair, its tinder, and its oakum, were made for him, when these excrescences are utterly purposeless to the economy of the plant, and as perfect superfluities to its structure as if a ready-twisted rope had grown out of its bark ? If not indicated in the same manner, the bark of our Alder is such that it has scarcely demanded the most common attention to see that it could be formed into mats, not less than the numerous flags ; though the application of these is more obvious. And whether the art of weaving has thus originated or not, we have proof of the former existence of such clothing, in the engraved Babylonian cylinders, as it was probably the origin of that checkered colouring in

more artificial webs, which seems to have been as universal as it is ancient.

These things at least the Creator of man has revealed to him : but why not also the less obvious fibres and uses of the Flax and the Hemp ? Assuredly He reveals His will to us, even on such subjects as this ; but in a manner that we rather will not than cannot perceive. He who keeps the mind of man in His own hands, has He not often revealed that will on far other subjects ; does He not daily influence our thoughts, yet we equally refuse to admit that influence ? We are governed, and we will not see it : vain of our own powers, vain of our free will ; and sometimes also averse to believe in His universal knowledge and universal government, because thus do we feel that the nakedness of our thoughts, wishes, and purposes must stand open before Him.

The Phormium tenax, the Papyrus, the common Reed, the Cane reed, the Bulrush, the common Rush, and endless other plants which I must needs pass over, would afford ground for similar remarks : but the preceding sketch, together with the light, neither false nor fanciful I trust, in which these subjects have been placed, should suffice : as my purpose will be answered if the reader shall thus be induced to turn his thoughts in the same manner, to everything around him ; being convinced that such views will afford both pleasure and instruction, and, I trust, not be unproductive of valuable moral effects.

In the peculiar products, or the secretions of vegetables, the range of substances and uses is so enormous, that a wide inquiry would involve a large portion of the arts of life. But if the selection is rendered difficult by the mere mass of the materials, the general conclusions need seldom be repeated. Nor need I be anxious

in separating what is strictly useful or necessary, from what is pleasurable or ornamental: as indeed such distinctions are unattainable. In different climates and stages of society, man himself differs. That which was once superfluous becomes necessary, and that which is a superfluity in one place is a necessity in another. Nor are new necessities the produce of luxury. Without certain arts, the state of society could not exist or proceed; and, for these, other things are needed: while the creation of new moral, commercial, and political distributions, and the inextricable dependence of the arts on each other, often render the defalcation of a substance, formerly perhaps useless, and apparently trifling, the source of a wide inconvenience. It was once a casual or insignificant fact, that antimony expanded on cooling, and communicated this property to the lead, which is also hardened: yet on this depends the art of accurate typography. A dye, the power of colouring a white vegetable or animal fibre, may appear to be a superfluity or a luxury; yet for want of this art, the uses of those substances would have been limited, or obvious inconveniences would have followed. Or, taking another illustration from the department before us, the perfection of music, with the whole of its wide influences on society, depends, as musicians know, on our power of dividing the monochord, through a nice sense of hearing which no mechanical contrivance could replace: yet the practical application to which this art owes so much would have been impossible, had not such substances as the vegetable resins existed. On things so apparently insignificant do results of great moment depend: while thus also must we extend our views, when we would judge of uses, as for this purpose chiefly have I introduced these illustrations.

To be as brief as possible in an enumeration which I desire to condense, the whole of the vegetable dyes may be considered in a single view, numerous as are the substances, and the colours produced by them. The facts themselves puzzle chemistry ; and the peculiarities are often such, that we cannot but consider them as designed : above all, when we find that many of them betray themselves, as Indigo does, so as not merely to be pointed out to man, but forced on him, even in his rudest condition. And if an instinctive love of ornament has been implanted, I can see nothing fanciful in supposing that the means of gratifying it have been supplied. An instinct without its attainable object, would be that solecism which does not occur in creation : in the inferior animals, the desire and the means of gratification are ever coupled : and I know of no reason in the metaphysical constitution of man, or the moral plans of the Creator, why it should not have been the same with ourselves. He who replies that man has no instincts, is not yet released from the trammels of a false philosophy.

Among other products of vegetables, when we look at the wide and indispensable uses derived from the resins, such as tar for example, and when we see that a particular organization has been fabricated for their production, must we not suppose that those purposes were intended ? and all their varieties are produced from the same limited elements, through niceties of proportions, such, that chemistry can neither investigate those, nor conjecture how such enormous differences as exist in the properties of those substances, should result from variations which must needs be minute. Common resin will not perform the functions of mastic, nor can this be rendered a substitute for copal : and if all this is

produced through the chemistry of life, and through special organizations, if these products never vary, though every plant secreting them is nourished by a common food, what other conclusion can we make, than that which I have already so often drawn? To deny it, would be that inconsequential reasoning which we should be ashamed of in any other case than that of the Deity. And when the Caoutchouc discovers itself, like the fibres of the Aloe, and the Varnish-tree performs, by itself, what would otherwise have demanded chemical knowledge, they afford the same arguments which I have already used to confirm these inferences.

I need not pursue this subject through the gums, the oils, and the numerous other secretions of plants, since the inferences would still be the same: though the oils might have admitted of more than I dare here take room to say, when we consider their incalculable importance in the production of artificial light. But no one can reflect for a moment on Sugar, one of the most singular productions under Chemistry, on its wide uses, on the universal instinct to desire it as a source of pleasure, and on the extensive consequences which follow to human society from it, without believing that it was created for man, as it is also his art alone which can extract it from the sugar cane. Both as an article of food and of luxury, it must have been the produce of designed beneficence; and though, in those moral and political consequences, enormous in their intricacy and influence, which have flowed from it, a perverse temper may overlook the good in noting the evil, the superiority of the former will not be disputed by a cool and candid mind, gifted with the necessary knowledge and power of reflection. I know not indeed whence we can ever believe in the designs of Providence, if we do not in

this instance: while, under views of His beneficence, it must be recollect that every good has its attached evil, that the well-known evils in this case were contingent, not necessary, that man is permitted to pervert good intentions to evil results, and that the beneficent plans of God, under which He, reversely, contrives to educe good out of evil, are ever slowly matured. I might here also point out some other vegetable productions, of which the influence has been even greater: but if the same reflection and knowledge can estimate the extensively physical and intricately moral effects produced by the Potato, by Tobacco, and by Tea, the tendency of the remarks and the conclusions is the same.

I may conclude the present subject with a notice of the medicinal uses, and, as I cannot doubt, the medicinal appointments, of vegetable substances. Diseases exist: we must admit that they were not merely permitted, but ordained, when we find that the mysterious substances termed contagion and miasma have been created and regulated for that purpose. Or if derangement arises from contingencies, or from the inevitable progress of an organization which was not designed to be either perfect or everduring, this also was foreknown, as it was permitted. Now, in the latter cases, we see that the Creator has provided remedies, by giving the organization a power of repairing injury or rectifying wrong; and often, by very singular and unexpected substitutions and expedients. Thence perceiving a decided intention to remedy disease by one set of means, we can safely extend the inference, and thus conclude that the substances termed medicinal were created and appointed for the same purpose. Or, otherwise, we might draw the same conclusion, from

knowing that the appointment of evil is never, possibly, absolute, or inevitable ; as in that very wide case where defences are given to animals under the system of prey.

If, further, there are diseases which are cured by specific vegetable substances ; if the preparations for those are unexpected and singular ; if the chemistry is abstruse ; if, under extraordinary and peculiar powers, their properties cannot be recognised by the senses, and, very often, not even by chemistry ; if they act only on the mysterious organization, still more remarkably, acting on that only when it is deranged ; if again they are useless for any other purpose, as for any other they never would have been sought ; and if, lastly, they are inactive or useless as to animals in general, while acting on man, and useful to him, I can see nothing wanting to complete the full inference here desired. And while this particular case seems to offer the most perfect demonstration yet proposed, I do not see how we can ever expect a more complete one, short, as I have elsewhere said, of a direct revelation.

The general facts here abstracted into the form of an inferential evidence, are well known to medicine. The science will guarantee them : though the reader might consult the writers on the art, to little purpose, for what my space compels me to treat very briefly, as there is much also which general readers could not understand.

That specific organizations have been attached to plants for these ends, is seen in the milk vessels of the Poppy, as in endless other cases. Here also chemistry has shown, that a specific compound, minute in quantity when compared to the whole secretion or medicinal substance, has been prepared ; being even astonished, as it proceeds in those examinations, at the number and variety of these, formerly as unsuspected as unknown,

and utterly unable to explain how such numerous, nicely distinguished, and active compounds, could have been produced from the elements which it presumes itself to know. But this science equally knows, that the substances in question present very few, and very little-marked characters, under common, or extraorganic chemistry: insomuch that it finds the greatest difficulty in distinguishing them. It may term them alkalies, because it can unite them to acids: it may term them aught else, under other vulgar and simple affinities; but the philosophical chemist at least is conscious that this knowledge is nothing. Their differences and powers are known only through their actions on the animal organization: but, even here, we cannot conjecture how they act on it, or in what manner they affect the organic chemistry.

Here then are a thousand plants, producing substances which are chemical compounds, yet are scarcely recognisable but by their separate powers on the living animal organization. They are most minute in bulk, the delicacy of their differences as chemical compounds must be extreme, the plants which produce them grow promiscuously on a common soil and through a common food, yet they are the same to-day as yesterday, and have never varied since the creation, though entrusted to the unconscious chemistry of a vegetable.

If chance, or if failure, could occur anywhere, it should be here: but the plant is ordered, and it obeys. Chemistry itself must acknowledge this, knowing how often its own products are those of casualty, as far at least as itself is concerned, and knowing how often the addition or abstraction of the most minute element would defeat or reverse its expected results. If thus too it knows, that even with what it deems an analysis

before it, all attempts to produce the same compounds are fruitless, what can it conclude, but that all this has been ordained and executed by Him of all power, and what other inference can finally follow, but that the ends which are attained were in His intention ?

The narcotics furnish specific evidence on one of the points which have here been stated generally. They act on the animal system, very remarkably, and usefully ; while, but for this, they need not have existed, since they serve no other purpose. Not less remarkably, they act chiefly on man, while, to many animals, they are without properties. The Goat feeds on every vegetable poison that exists : tobacco, so active on ourselves, is eaten with avidity or indifference by every herbivorous animal on which it has been tried. Here then there must be a special, if not an exclusive, destination for man and his wants : and if the cause must be singularly minute and abstruse, when, as far as anatomy and physiology can teach in anything, the nervous power and the animal chemistry should be the same in all, the same inference follows. In the one case also, the nervous power is extinguished by a compound, which is neutral in the other : the narcotic, Opium, is appointed to act, not on all nerves, but on those of one animal, and its action is, to that animal, made useful ; or, as the narcotic is appointed to act, so is the especial nerve ordained, or excepted, to feel. It is one of those remarkable cases of adaptation which I have so often pointed out ; and how then, again, can the design be questioned, or, under a useful result, the intended beneficence be disputed ?

The term narcotic, moreover, including all the substances which diminish the nervous power, and which, consequently, can destroy it and produce death, com-

prises many compounds, acting so diversely, on us at least, if not on other animals, that it is impossible to comprehend how their differences could have been produced, on those separate powers, under one general effect, given. Opium, Tobacco, Cicuta, Conium, Lettuce, Datura, Henbane, Laurel, Nux vomica, Belladonna, are examples; while some of these have proved specifically useful, as the uses of others remain to be discovered. Had there not been such separate uses intended, these niceties of invention would surely never have existed. And this inference is strengthened by knowing, that in a different set of medicines, producing one general effect, there are similar distinctions; while, in this case, we are fully aware of the value of the several modifications of action resulting from those. From Aloes to Elaterium, through a considerable range of substances, the science of physic well knows that there are many with which it could not dispense.

If I said that some of these substances acted on the disordered body, and not on the sound one, this is true of the Peruvian bark; as I might easily produce other instances. It is as if a certain substance had received a special commission for a specific derangement, or a given number of those. If it should further be true, as has often been asserted, that there are plants, in America and elsewhere, which afford immediate antidotes to the bites of venomous serpents, while they are also without any sensible properties, the appointment of a chemistry so unintelligible, to remedy a contingent evil, with the equally singular provision, that of two similarly obscure and peculiar substances, the one shall neutralize the other, and do nothing else, must leave even less doubt as to the design: though it should not prove true that such plants grow only where such

serpents abound. And even the very singular action of Digitalis, a plant without otherwise marked properties, on the heart, and on that alone, while it is also solitary in this power, must lead to the same conclusion of a special appointment to that organ, for some useful purposes; though we may not yet have discovered those.

But if I quit a subject which I might easily have illustrated at far greater length, I cannot terminate this chapter without a general remark flowing from the preceding views. I doubt not that if there have been antidotes provided for the poisons of serpents, so have there been neutralizing agents appointed for every poisonous substance, though the discovery will be progressive and slow, in conformity to all else that we see of the system of creation. Nor do I doubt this, even as to the great sources of disease; while there is reason to believe, that it is the vegetable kingdom, principally, which will furnish, to a more enlightened posterity, at some future time, what we have too much neglected to inquire of, chiefly perhaps from the usual temper which mistakes the censure of folly for wisdom. But though believing that we are in the absolute infancy of knowledge respecting remedies, I do not mean that man's structure can be rendered immortal, or even his allotted period delayed. It is, that the Deity has made beneficent provisions for diseases, that He has admitted no source of possible injury, or appointed no evil, without establishing corresponding means of defence and of mitigation, that He has concealed much of this as a stimulus to man's intellect, and that He has everywhere marked a decided intention of rendering the earth, and man, in his race, progressively better: while to this I may perhaps add, that as man must be

more valuable in his Creator's eyes as he advances further from the merely animal condition, so may it have been His design to take most care of the races which have progressively learned best to know and to perform His will ; to fulfil the ends for which the only progressive being, the only being which is not doomed to die for ever, was created.

C H A P T E R X L V.

ON THE USES OF INORGANIC SUBSTANCES TO MAN.

I PROCEED to consider whether the Creator's beneficence to man is not also indicated in the constitutions of the various inorganic bodies from which we derive advantages. If it is still the question of final causes, or of the Deity's intentions, I must repeat a remark made in the 43rd chapter, because it bears peculiarly on this subject, and as its value might there have been overlooked. It is, that they who attribute these acquisitions to man's own intellect and industry, acting on casual or unmeaning arrangements, have forgotten that while the state of man was meant to be progressive in good, the mode of attaining them has been ordained to furnish him with a perpetual occupation for his mental powers, through a continued stimulus in research, and in the sense of success ; the absence of which might have left his faculties undeveloped, or allowed them to fall into a state of torpor. The remark is that of ancient philosophy, and of ancient poetry : in this, and in far more, teaching us lessons of moral science, of morality, and even of piety, too often overlooked in the acquisition of a language.

Commencing with the metals, Iron demands the first place, from its universality, and its indispensable uses to man. We know, through the researches of modern geography, how difficult it is for man to emerge from

the savage state without it : and the avidity with which it has been sought is a measure of that value which even the most uncultivated people have learned to appreciate. That modern society could not have existed without it, I need not say ; when the numbers of man would have been as nothing to what they are, his power nothing, and his political condition of the lowest ; while his moral one must have been measured by the same scale. We are too apt to forget how much he depends, and not only as the moral, but as the religious being which he now is, on causes which appear unconnected with such effects : on things which seem mere casualties, or trifles, or the chance aids to luxury or minute convenience : yet a very little reflection would, even in the case of this single substance, convince us of the truth of the preceding observation.

If I noticed the universality and abundance of this metal, it is not less remarkable, that many of the rudest nations have discovered the art of working it : though peculiarly difficult, from its being nearly unknown in the metallic state, and from the refractory nature of its ores. If they have not always profited by the acquisition, so as to rise to a higher degree of civilization, this is easily explained, from other considerations : while we have no right to assume, that the mere possession of increased power should supply the want of everything else.

Could such an art have been discovered by rude and ignorant people, or by early and uninformed man ; as, by him it seems to have been known from the remotest times ? It may be doubted : and when the universality of this knowledge is coupled with that of the metal itself, I, at least, as much believe that the Creator Himself has given this needful knowledge to the human

race, if through means that we cannot ascertain, as I do that language was not of man's own invention. Why indeed should He who has given reason, faculties, to man, not have communicated more? why not have given specific knowledge, as He has to the Bee, when all that He has given was for the uses of His creatures, and when He knew that the general faculties allotted to the first in rank of those, were inadequate to fulfil His intentions? We do not doubt that the Creator intended man to be what he is; we admit that He has wrought for that purpose, and why then should we limit Him in the choice of His own means. We do not indeed perceive this influence over our minds, nor is it unnatural to imagine that our own powers originate every thought: but can we doubt that we see it in the Bee, even to the extent of direct instruction in a distinct art. It is a considerable presumption which reasons differently in the two cases: but it is also the vanity which would attribute everything to itself. It is more, when it is the presuming vanity which would dictate to the Deity how He ought to have acted; and it is worse than an inconsequential reasoning, which admits His government in the general, but would deny it in the particular. Is it not even the same principle which denies a distinct verbal revelation of God's will? How far this view is supported by many other facts, I need not say; especially as those have elsewhere led to similar reflections.

Gold is scarcely less diffused, though far more scanty; and there are circumstances in its nature which seem to have pointed it out to man, for those very purposes to which he has applied it, or at least for the greatest of all its uses, that of being the most convenient representative and equivalent of value, the measure of

all wealth, and the substitute for all that man might desire to exchange with his fellow-man. It ought to have been in small quantity, and only to have been attained through much labour, or it could not have served these purposes; since labour is value, and abundance cheapness: while the latter, implying bulk, would also have defeated the end, in destroying its convenience for use. It is so ordained. It ought to have been placed in the earth in its metallic state, or, small as the quantity must have been, it might have been lost, or would never have been discovered, or even conjectured to exist. It is metallic, and also imperishable, or unalterable through the action of the elements; and thus alone it is discovered. Thus also, when possessed, it is easily preserved; whence its useful properties are the better ensured. Could a more perfect arrangement for ends have been made by man himself, and ought he to doubt the appointment? above all, doubt it, when but few metals possess any one of these properties, and not one includes the whole? He would willingly indeed possess it for its other valuable qualities; but he cannot have contradictory things: its mechanical appropriations demand that abundance which would have destroyed its commercial uses.

Silver admits of similar remarks, under some modifications on which I need not dwell. And in this metal, man possesses what he wishes for in Gold. He derives mechanical uses from its mechanical and chemical properties: if they cost him a high price, the representative power would have disappeared under an acquisition attained with less labour. And through both he derives enjoyment, independent of mere uses: inasmuch as beauty, ornament, distinction, luxury, are among the endless modes of pleasure or happiness

appointed or permitted to him. And if the possession of the means of these, as of all other good, is the basis of his enjoyment, generally, so does the desire form the stimulus to his industry, and to all the endless train of good which follows from the cultivation of his intellectual powers.

It is a morose temper, it is often envy, it is always a false view of man, and of God's appointments respecting him, which censure the pursuit of even these comparatively trifling sources of pleasure, or condemn the enjoyments which they supply : it is a deep ignorance, added to all this, which condemns wealth, riches ; condemning money, as it is termed, under a phraseology of usage which ever forms the philosophy of the feeble and ignorant. Riches ! what would man be without the desire to possess them, what without the possession, what without the desire to increase his possessions, what even without the love of accumulation ? Harsh terms of usage are applied to these : but, without them, man would hardly be known in the world, except in a condition under which it might have perhaps been as well that he had not existed. Who, in civilized society, would possess even food, if the desire of riches did not bring it to their hands ? Without the desire for riches, man would not weary himself in cultivating the earth ; without the possession, without the accumulation, he could not have cultivated it to that which it now is : it would be the desert and the forest and the marsh which it was at its commencement, to which it returns when man ceases to seek for wealth and to store up riches. Deeply ignorant indeed is this to be, of the nature of man ; still more deeply and culpably, of the never-failing wisdom of God, ever planning in beneficence what that wisdom executes. Wealth, the means of

wealth, the representatives of wealth, have been created and ordained for the best of purposes, under the beneficence and wisdom that never fail. The desire of wealth has been given for the same ever wise, ever beneficent ends: the love of accumulation produces that great engine, the "capital" of the economist, through which man becomes progressive in good, by which the whole earth becomes progressively better, more replenished with man, and by man in that ever improving mental condition through which he learns best to know the will and fulfil the intentions of his Maker. Let moroseness and ignorance learn to see and to think more justly, but if still finding reasons to arraign the ways of Providence, let them not forget, that while good has been intended in all that has been ordained, the seeds of evil have not been separated, nor the freewill of man controlled, in extracting that evil from them.

In Copper, we find a metal which, for its uses, is the nearest in mechanical value to iron, while next to silver in difficulty of attainment, and therefore in cost: as far at least as our present possession and knowledge are concerned. Thus partaking with it in the power of representing value, we cannot fail to note a series of adaptations which is easily referred to our own discernment and ingenuity. Obtaining from it also those mechanical uses which iron could not have furnished, so does it perform for us much of what even silver could not have done: while, betraying itself, even to uncultivated man, from its existence in the metallic state, it affords those similar arguments, which, already deduced in speaking of gold, I might equally have drawn from silver.

With the exception of Quicksilver, similarly dis-

closing itself, the remaining metals do not afford many examples of that metallic condition which man could not have overlooked ; while, as I am not discussing the facts of mineralogy, I need not point out what those are. All else seems to have been left to his own industry, and to the gradual development of his powers or accumulation of his knowledge. Possessed of the general principles through which the metals are recognised and can be obtained, by means of those of most easy study, he continues to seek and find the metal in the ore ; thus deriving uses which he never could have foreseen, and daily deriving new ones ; as many more of these substances doubtless still remain, to excite to further industry, and to furnish yet unsuspected advantages.

I may continue to point out some more of these substances, with the various, and often remarkable uses derived from them, under a variety of properties, so differing, and so singular, that it is impossible to doubt the appointment of those special qualities and distinctions, and their intention for the uses which man derives from them. If not, there has been a very extraordinary exertion of the Divine power, for no designed end ; since it is scarcely chance which contrived Iron and Quicksilver, Gold and Arsenic. And believing them to be simple bodies, the conclusion of chance, or absence of design, would be still more extraordinary. We can easily conceive chemical chances to have acted in the production of compound inorganic bodies ; in that of a salt or a metallic ore ; but, in that which is uncompounded, which is an ultimate substance, or an element, there must have been a specific act of creation. And though the metals were hereafter to prove compounds, the value of this argument would be

little affected. No ordinary chance at least has produced them through chemistry, because our utmost efforts to form them, or to resolve them into their elements, have failed ; while those labours have not been trifling. And if these are specific creations, like air and water, even more obviously so than such compounds are ; if nothing has been created without a specific purpose ; if, in the metals, there are many distinct creations or designs ; if man derives specific uses from all or many of them, and if no other uses can be discovered, or even imagined possible, why may we not believe that the creation and the intention related to ourselves, as so much more must be inferred to have done ? Almost as well might it be thought, that the hand of man was not made to be his servant.

If I cannot here describe all the uses of all the metals, it may truly be said of a great number, that we should have failed in something important if we had not possessed them ; while we shall think and feel the same hereafter, respecting those whose uses remain to be discovered, though overlooking or despising them now. This is what we have done in this department, at each successive acquisition : it is what we do in everything : thus also for ever denying the intention of God, because our ignorance has not yet discovered what that intention was.

There was a time when we did not know of the existence of Platina, and there was a subsequent one through which we did not know its uses. If some of those at least are now known, they are limited by the rarity of that metal : but we cannot decide that it is not stored up, valuable as it is, and unreplaceable by any other, to reward the industry of future races, and carry on the continuous chain of improvement. Many years

have not passed since the existence of Chrome was unsuspected : and, for a time also, it was neglected or despised. We have now found that it abounds, and we have extracted from it valuable uses. We never expected to have dyed cotton with a combination of metals ; yet is this among those uses. Thus may we yet discover many more, now as unsuspected ; thus may those which are now as rare as Platina, be found in abundance ; and thus may even greater uses be extracted from what is now of limited value, or important ones from those which are neglected. We almost despised Manganese not long since, from its very trifling use in the colouring of glass : we did not then know its power in bleaching that important product of art, still less did we foresee that the arts of bleaching and colouring cloths would one day make us congratulate ourselves on the abundance of a substance at whose useless profusion, as it was deemed, we were inclined to wonder ; or, that out of an earth trodden under foot, we should extract the means of destroying the most numerous and extensively destructive of all those poisons which invade the source of life. There was a time when Cobalt was thrown away, as Titanium almost is now ; yet without it, one of our chief ornamental arts would be almost helpless : and if we have hitherto derived but little use from the latter, that also may remain in reserve for our successors. And we cannot believe that Molybdene, Tungsten, Uranium, Tellurium, and many more yet untried, were created for nothing, especial creations as they appear to be : it is but yesterday that we were ready to say the same of Nickel ; yet, under a most unexpected combination, it has given us that mimic of silver which copper and zinc had done of gold. We have long found an un-nected medicine in Quicksilver ; a power which had

been doubted or denied, acting peculiarly on one portion of the animal, or rather, the human body. The possibility at least of specific actions on every organ is thus proved ; and who shall say, that even among the metals, such powers may not exist, and that the art of medicine, so needful to man, may not derive from them valuable uses. Being so, these properties are known to Him who made them ; they were not made without a purpose, and when the use shall be known, must we not believe that it was intended ?

And this metal at least deserves some further remarks. It breaks through a general law appointed to its whole class. Were it to be discovered for the first time to-morrow, few, even among chemists, would believe in a report of its properties, or be satisfied without the evidence of their own senses. When every other metal requires an intense heat to become fluid, when, in many, this is so high that we know not how to estimate it, scarcely even to produce what is necessary for that purpose, here is one which at first appeared to depart from all rules, in being for ever fluid. It was not without labour that it was proved capable of becoming solid : and even now, the wonder is scarcely diminished. And let us inquire to what uses this and the concatenated properties of this metal have been applied, before we say that they were given without design, and that we have invented the uses. Its most familiar use as a counterpoise to the weight of the atmosphere, could be replaced by nothing, though its thermometrical one admits of substitutes. The production of a polished and nearly unalterable plate of metal, by means so easy and cheap as it affords, through its union with tin, is a fact so familiar that we pass it without notice. And as if it had been ordained to

unite to metals, chiefly, if not only, where that union was useful, so are its other tendencies directed principally to gold and silver: while this, added to the fluidity which its own singular nature communicates, and to the vapourability dependent on that, gives us a command over the acquisition and the application of those indispensable metals, which we could have obtained in no other manner. But for Quicksilver, in vain would the larger portion of gold and silver in the earth have been created: if the intention for man is proved by the appointment of any one, far more does the intricacy of the total contrivance prove the design. If man could have formed a wish for such an engine in this case, he would have felt that it was a romantic one; and far indeed would he have been from devising the one which he has found in quicksilver. He that formed the eye, shall He not see?

I might still interest the reader by pointing out many more of the metals and their uses, as I might almost fill this book from any one of these chapters, did I adopt that usage, which I must condemn in my predecessors, and above all in the last; exhausting one department of science to the neglect or suppression of others. Convenience to the writer forms no apology for oblivion of the reader's interests: and whatever other value may flow from the division of labour, there is none to compensate for the superfluity that must follow in this case. Suffice it, that I point out the easy fluidity of Bismuth, applied to soldering, the unexpected adhesion of Tin to Iron, with the new command thus given us over this metal, the unexpected alloys formed by mixture, as in the case of speculums for telescopes, and the splendid light produced by the combustion of Zinc. The multiplication of evidences of one class

will not add to conviction; nor will that conviction which has not followed one striking fact, be attained through numbers.

I will not however dismiss this class of bodies, without further illustrating, by one remarkable fact, the assertion that nature probably yet contains many substances which time will discover, and from which posterity will derive advantages. Whether Iodine be truly a metal or not, is indifferent for the present purpose: the places and the substances which contain it had been searched thousands of times. No one could have suspected its existence, and all would have denied the possibility of a new substance in a sea-weed; much more, of a new element in nature, to take rank with perhaps only four others. Yet what we call accident brought it to life, and in very unexpected hands: while forgetting the vanity that would have denied the possible existence of such an element, and in such a place, we continue no less vain to-day than we were yesterday. It was not for no purpose that so remarkable a substance was created; so high in rank, if it is one of the undecomposable forms of matter: and here especially we should believe that the Deity intended something for us, when it takes no share, like its congeners, hydrogen and oxygen, in carrying on the great system of nature's chemistry. Nor can we believe that its present narrow uses in medicine were the only ones intended, since they seem insufficient to justify an invention so peculiar.

One or two observations more, relating, not to the uses but the positions of metals, ought not to be omitted; while the fact which I shall first select continues to indicate a special design of beneficence. The facility with which Iron is obtained, is singularly exemplified in

our own country, from its juxtaposition with coal, and under a remarkable form: and though the fact has often excited admiration under the present views, the most important reflections to which it gives rise have been overlooked, for want of the necessary knowledge. I have elsewhere proved, that the beds of coal were originally peat; but there is now no ironstone deposited with this substance, nor any thing which could ever be converted into it. We cannot even form a conjecture respecting the sources of this deposition in former states of the earth; but, not being a necessary deposit, under the geological laws which have ever been uniform in all else, since it does not occur now, why may we not believe that there was a special appointment for the purposes which have been fulfilled?

We often regret the partial distribution of certain metals, such as Silver and Tin; yet this distribution may have been the intended one, since it is productive of good ends. The rarity of Silver I have shown to be necessary. That of Tin, and of many more, may have been intended with a view to commerce: part of a wide appointment pervading all nature, and apparently intended to lead to the general communication of man throughout the globe, with all the endless beneficial consequences thence resulting. If it is a fanciful view, to suggest that the early civilization of Britain was produced or aided by the limitation of Tin, still, the Deity ever works by means, even more apparently circuitous, slender, and improbable; being, however, all of these to us, only because of our far more limited power over causes and effects. Britain would have assuredly been civilized at some day; but the period might have been much longer delayed, had not Phenician or Carthaginian commerce led to the intrusion of

Rome, warring then on uncivilized nations, even as we do now, not for fanciful honour alone, but with a view to commercial benefits. Thus did even the amber of the Baltic and the pearls of Wales aid in producing those great results, consequent on the systematic aggrandizement of this extraordinary empire, to which we owe the great high road so widely traced for the introduction of Christianity : remote as the causes and the effect may here seem.

Of the rarity in the distribution of the metals, and of the labour through which they must be obtained, it is usual to speak with regret : yet the complaint is not wise, while the fact is but conformable to the general laws by which the world is governed in everything. The price of everything is labour ; and the value holds a course with that which has been embodied in the production. We do not produce bread without cost : did we complain that it was not to be gathered by the roadside, it would be to forget that man would then be no other than the beasts of the field, with other consequences too obvious to require being indicated. A more careful consideration of the principles of public economy, by those who would thus improve the system of the world, will show that in every other analogous case, as well as in the present, it would not be changed for an imaginary better one, without so disturbing an order of production and cost, of value and labour, as to lead to evil consequences which had not been foreseen, and often to very remote ones : causing the projector to doubt his own power better to regulate the government of even this small portion of the universe. The entire system of creation is intricate as it is extensive : it is intricate in the parts as in the whole : and he who shall meditate the most carefully on it, under the widest

knowledge and the highest capacity for thinking, will be the first to admit that he is unable to suggest an amendment, even where a first view seemed to leave no doubts in his mind.

From the metals I may pass to the other inorganic substances, consisting of salts, minerals, and rocks, (using those terms in their popular senses) yet confining myself to what may be most striking or interesting in so vast a mass of substances. That we derive from them great, and often singular uses, with the accomplishment of desires, which, before we knew them, would have been deemed hopeless, and that we have no reason to believe that we have discovered all the substances and exhausted all the uses, is no less true than in the case of the metals. In many, similarly, the singularities of property are so striking, and the adaptations to our wants so perfect, the mode of production is so remarkable, or the substances are so much in the nature of exceptions to the mass of general rules, that we are equally compelled to make those inferences which I need not now repeat. That the Deity created all those things, we cannot doubt: that we derive benefits from them, we feel every day: and may we not then ask, in the words of Seneca, less a heathen in his views than many who have received greater light, "Non dat Deus beneficia? unde ergo ista quæ possides?"

In the minerals, the beauty and the rarity of the precious stones naturally claim the first place for those productions: and be it explained as it may, mankind, in every state, has shown an attachment to them which seems instinctive; evincing it, without any special regard to their value, and even when insensible to beauty generally, and careless respecting superfluities. But

for this quality of ornament, exciting desire, we do not easily perceive a sufficient reason for the existence of these substances: among which the Diamond, chemically viewed, is an exception to all the laws which have produced the other minerals. Unknown, it would have been incredible by chemistry; and a substance so singular should therefore have been the produce of a specific design, though the other precious stones should be as casual productions as many of the earthy and metallic minerals seem to be. That one at least should have a corresponding use, on the general principles already laid down. And assuredly it has such, as a source of pleasure, and the ostensible indication of wealth and rank: while if we consider well, under truly philosophical views of human nature and society, these were not unworthy ends; as the Diamond, of very limited mechanical uses, might also justify its own existence as a highly condensed measure of value. I need not extend these remarks to the other precious stones.

In the enormous number and endless varieties of the crystallized, or other minerals, of whatever nature, I confess that I can see no defined purpose, otherwise than as the metallic ones are concerned, on the grounds already stated. Here, if anywhere, philosophy might be justified in its too common hypothesis: since the laws of chemical combination, established for certain specific ends, might have also acted for ends that were not designed. Yet this is but the explanation which ignorance gives: the judgment must ultimately hang on a moral question which we shall possibly never answer; namely, whether the Deity has permitted anything without a purpose, since we cannot admit that He has created for no ends.

The inflammable minerals give rise to very different reflections ; as, above all, does that one so infinitely more valuable than diamonds, and almost than gold. Every day we look with indifference on Coal : while even they who can see the full extent of its uses, can scarcely view it as it deserves, because they do not know the extraordinary appointments under which it was formed and stored up for our use. Yet few ever consider or know, that on the existence of this apparently mean substance, depend the production, the lives, amid the crowd of the world, of perhaps ten millions of men in our own Britain ; that thus alone have all these numbers been called into life and continued in life, that not only do their comforts and wealth depend on this common and almost despised mineral, but that hence flow the strength, power, influence, command, the political, and even the moral, and, with the moral, the religious existence of our own wonderful country. "Non dat Deus beneficia ?" when by this simple contrivance, this one mineral, He has given to two small islands a virtual extent of territory, with corresponding wealth and power, greater than has been allotted to spaces a hundred, a thousand times larger in other portions of His earth. Thus can He compensate in one way for what He withholds in another : thus can He dispense with territory, space, climate, position, soil, forests, and, but for the political casualties which spring out of man's vices, with food itself.

And extraordinary as are these effects, in no less extraordinary a manner has this invaluable substance been produced, stored up, and rendered accessible. Why the Creator chose to adopt this plan, it is not for us to ask : yet it required no less than the existence,

through uncountable thousands of years, of an entire modification of the globe; to form it, as I have proved in another work: no less than the successive growth and destruction of thousands of generations of forests, and, with all this, a specific distribution of the surface of that globe, far different from what we now see. Whether all that followed, that complicated succession of revolutions which I have equally proved, was necessary for the ultimate purpose, we cannot be sure: but we have no reason to believe, that under any other circumstances, that great preparation of vegetable matter could have been reproduced in the state in which we now possess it, and moreover, placed in such positions as to be accessible, under the exertion, and perhaps not too great an exertion, of human labour. The end was great, and great have been the means: they have been singular; and we cannot easily judge wrong in believing, that all this was done for us and for our good: peculiarly independent of all the usual facts in the history of the earth, as the production of this mineral appears to be.

Though Sulphur is one of the most remarkable chemical bodies in nature, and though the manner in which it is brought to our hands is not less striking, I must pass it over, to notice Salt, a substance so indispensable, that man scarcely can proceed without it. It would easily be supposed a necessity under some other purpose, which we have converted to our own uses, if it were true, as writers assert, that it was needed to preserve the purity of the ocean. This view, sometimes meant to be a pious one, is founded on ignorance: and it is an instance of those conclusions respecting the Deity, which have sometimes brought ridicule on injudicious theological writers. Whatever uses it may

serve there, it does not conduce to that end at least: while the only ones which we can yet prove, are those which concern ourselves. That in increasing the specific gravity of the water, it renders the sea more buoyant, is too narrow a purpose to account for such a production, as the navigator of fresh lakes proves also that it is of small importance; and I have proved that it is not necessary to the respiration or residence of fishes. But the slightest attention to geography should have shown that its purpose could not have been that just noticed, when the great lakes of America are preserved from putrefaction without it: as nothing but extreme thoughtlessness could have forgotten that even our common ponds are often teeming with fish, and further with insects and vegetables, in a far greater degree than the ocean or any of its seas. So far indeed is it from being true, that such inhabitants corrupt the waters in which they reside, that their effect is the very reverse. Fishes, frogs, and even larvæ, preserve the purity of water, by devouring the minuter animalculæ and the vegetable fragments: it is one of the beautiful contrivances in nature for this very end, as its analogy to the action of terrestrial larvæ for similar purposes in the air, is obvious. And if I have proved, in other writings, that the exposure of water to the action of the air, is a steady cause of its purification, while it is effected through the winds, through the flow of rivers, and through that unceasing internal circulation which, though depending on its fluidity and on changes of temperature, was probably appointed for this purpose, as the movements of the air have been intended for a similar one; if I have also proved that the intermixture of sand and of clay, consequent on its greater motions, forms another active cause, and that both operate by

precipitating injurious matters in solution, the idle fears on this subject should, now at least, cease. Man had not seen it ; but the Creator has not left an end of such importance unprovided for ; while had salt been the adopted means, He must have failed of His purpose, not merely in the fresh waters of the earth, but in the ocean itself, since the salts there in solution accelerate, instead of preventing, the putrefaction of animal matter. Thus necessary is it to know Creation, before we draw inferences from it respecting the Creator ; and thus also does the extension of knowledge extend our conviction of His wisdom and care.

But it is not in the ocean alone that Salt has been stored up for man's use, or for other yet unknown uses ; while we can scarcely avoid believing that such will be hereafter discovered, so vast is the whole store, so widely is it spread, and in so unaccountable a manner is the terrestrial portion of it disposed, as it has also been produced by means which geology is unable to explain. Rock-salt is indeed confined to a single and a peculiar sandstone, but that stratum is spread over the whole world ; while in this also remarkable, that every other associated stratum is of partial occurrence, and that many are exceedingly limited. All the sandy deserts of Asia and Africa consist of this rock ; and hence the desert, and the salt desert, are equivalent terms, as hence also the brackish waters and the salt lakes of those regions. I need not here point out the other innumerable places in which this sandstone with its salt occurs ; but I must note the unfounded hypothesis, that these deserts have been quitted by the sea in recent times, and that hence their saltiness. The purity and solidity of the masses of rock-salt, their bulk, their insulated and peculiar positions, with many other

facts on which I need not here enter, prove that they could not have been derived from the ocean in the manner thus supposed, nor, probably, in any manner. They are special and original deposits, in whatever way produced ; as of the Design we cannot doubt, though no other ends should have been in view than the uses of this substance to man.

In Gypsum, we find a very remarkable salt, whether we consider its nature, its uses, or its very inexplicable origin ; although its minor importance almost deprives it of interest, in juxtaposition with the former. If also there is but little apparent interest under the present views, attached to the several salts found in the mineral waters, since their medicinal uses can lead to no new remarks, we must not forget the extensively collateral consequences produced by the mineral springs of the world, though the inferences deducible are similar to those already drawn from the attachments of mankind to certain vegetable productions, of fanciful rather than of real use. It is indeed, the very purpose of every work of this nature, to point out the hand of the Deity in everything : but aware of the loss of influence which a writer would experience from pushing his illustrations too far, I shall terminate these observations on the salts, with a notice of Borax and of Nitre.

The former is so indispensable in many arts engaged in the working of metals, that we have not yet found a substitute : while it has been known from the most remote times, though confined to a very narrow tract in the East. That limitation is as remarkable as the rarity and localization of the diamond : the uses of this salt are not less peculiar, and even more striking are the origin and constitution of a substance, of which the essential ingredient, boracic acid, is one of the

rarest productions of nature, as its basis is one of the most singular.

If we can suppose that the extraordinary results produced by Nitre were not foreseen and intended, the whole of this inquiry, and all similar ones, ought to be abandoned. With the trivial exception of occasional sulphite of ammonia, there is nothing analogous to it, in origin and production, throughout the whole history of chemistry. This science knows what its ingredients are, and that it is produced on the surface of the earth, through some action of the atmosphere; but it knows no more. It is a salt, but not a mineral: one of those cases which I have elsewhere called exceptions, and which almost seem to indicate a special provision for a particular end. All its other uses fade into nothing before that through which it is the basis of gunpowder. We cannot but believe, that if the Deity really takes any charge of the government of the world, if He ever designed anything for a special purpose, He foresaw and intended the uses to which this substance is applied. The moral and political consequences have been too great, the effects on the good and evil of the world have been too extensive, the whole history of man has been too deeply implicated in the results of this production, to allow us to suppose that all this was not designed, as it was foreknown; unless indeed the Creator intended nothing, and takes no concern in His creation. How far, evil, and how far, good, have been produced by means of this powerful engine in society, I need not here ask: but I shall at least side with the majority, in believing that the good has far exceeded. And, whatever intricacy there may be in the immediate results, this at least is certain, that it preserves to wealth and civilization, the superiority over brute force: to

superior knowledge and humanity, the power of resisting ferocity and numbers ; with this important consequence at least, that utter barbarism can never again overwhelm those, and gain the dominion of the world, to the obstruction of man's progress in intellect and in morals. Nothing but Almighty wisdom and power could have discovered and created an expedient for this great purpose ; such means of counteracting an otherwise inevitable evil : nor will poetry, at least, persuade us that the invention was derived from the source of all evil.

Having elsewhere spoken of the progressive improvement of the world, I must here ask further, why was not the knowledge of this extraordinary compound permitted at an earlier period of man's history, when the materials had been so long prepared, and were well known ? Rather, why was the knowledge of its peculiar uses not permitted, when the compound itself was well known ; for this is far more remarkable. Ignorance alone, very widely spread indeed, believes that it is as recent a discovery to the world at large as it is of recent knowledge to Europe. The nature, the properties, of this invention, were known to the East, from the most remote period of history : even its warlike uses are recorded in writings which appear to date from the age of Moses. If admitted to have been known to the Chinese, from a very high antiquity, it is also proved that this vain and pretending people are indebted for it to their Mogul conquerors. Yet are not even those ancient races the inventors ; since it is traced beyond them, to Pegu, or more properly perhaps, to Cambodia ; to a people who still produce effects by it, which we cannot imitate, and dare not even attempt : a sufficient proof of the ancient posses-

sion of any art. And if the most ancient of all these records points to its military uses, the proofs of those abound in others, which, though posterior, are still of a very high antiquity. If I have collected these elsewhere, implying a mass of overwhelming demonstration, I must here be content with noticing their occurrence in Greek history and poetry, of the times of Alexander and of *Æschylus*, and with pointing out, that even the use or power of this material in projecting heavy bodies from tubes, was known to imperial Rome, to Tiberius : while if its warlike application by the Arabs is far more recent, it still long preceded our own, as it was also derived from the far more ancient eastern people who thus warred on Alexander, as they had warred on each other long before.

Yet the seal of fate, rather, the seal of Providence, was placed on this knowledge. The material was known, its powers were known, even to the detail whence we now derive its warlike uses ; its very military applications and powers had been repeatedly witnessed for ages, yet it was neglected. To us, at present, this seems impossible ; and especially impossible, when so many arts were in a state of high refinement, when there existed minds and talents never perhaps surpassed, and where war, far more the great pursuit than it has since been, might have been expected to seize on any means of attaining its objects. Nor on this alone had the Deity placed His prohibition : while I must note some parallel cases, at least, for the sake of an argument so important. The power of the Magnet was known to Greece, yet its great property was not discovered : and again, it had been discovered and applied in the East, long before it was known to Europe, far more deeply interested in the application. It is still

more incredible, that Greece and Rome should not have discovered the art of printing ; since the latter at least possessed alphabets cut on dies, and printed names on bricks : it is incredible that it should not sooner have spread to Europe, from the East, where it had long been known. It is still more inexplicable, that the art of printing from engraved plates should not have been found out, when engraving on metal was in common use, and when even impressions were taken in wax. Whether on a surface of this nature, or on a projecting and rough one, daily accidents must have led to the results which constitute the essence of those two arts. Or, again, under the daily use of single lenses, it is incredible that no casualty should have united two, and produced a telescope.

I know of no answer but one ; and it applies equally to the whole. The time was not come : it was not permitted. God can blind those whom He wills to deprive of seeing and understanding ; as He instructs men when He desires that they should know. This, we have even been told : if we have been disinclined to believe it, the proof is before us. But why should it be disbelieved, even on subjects of this nature ? He at least who admits that God governs the world as He created it, must believe ; and must also believe, that if He withholds knowledge, so does He impart it : giving and refusing, as He sees best, under the plans of His eternal providence. There is not one of all these inventions, these additions to human knowledge, which has not had the most powerful influence on the moral condition of man : any one of them would have changed the face of the world ; jointly, their effects have been such that a volume would not describe them. And if God does not interest Himself in the moral condition of

man, on what, in the whole creation, can He be interested? and why did he create, if He took no interest, had no intentions? Why is there an earth, a sun, the universe? and if it is by means too, that He works, if it is often by those which seem to us far remote from the results, what is this, but that He is wise and powerful, and that we are ignorant? Did we not know this before? By the aid of a fly, He can expel nations from their lands: the locust is His appointed scourge when He would smite a people with famine and pestilence: nay, He can destroy them when He pleases, by that which is without weight and without measure, which is unsuspected and unknown, which a thread will transport from land to land, or the winds of heaven waft over the entire earth.

The last division of the mineral substances includes the stones and the clays. If, under the peculiar appointments for man, shelter has been rendered as imperious a necessity as clothing, if substances have been prepared for this purpose, which he has been gifted with ingenuity to apply, and if he has been further provided with intellect to effect this end in a progressively superior manner, which, if he had not, he would have been judged less worthy of his Maker's regard than the Beaver and the Bee, we ought to believe that the means were created for him, even more than the wool of the Sheep, since to all other animals they serve no purpose. It is an inconsiderate or a fanatical judgment which thinks that a Being so great and so powerful could not have attended to such trifles, or which thinks Him insulted by such a supposition. Compared to Himself, what is there worthy of His notice? He who cares for the minutest insect as for man, cannot have judged anything beneath His regard: and if He

has provided for the wants of even the living atom which escapes the microscope, it is our duty to believe that He has neglected nothing which could concern our own, infinitely more numerous and complicated as they are, even to the production of a sandstone for building, a limestone for cement, and a slate for roofing.

Is it that associations like this are deemed improper ? Let the student of creation accustom himself to think otherwise, else will he fail to discover that the Hand of God is in all His works, and learn to neglect Him. Or is it that such attentions are deemed mean, because our own pride, or negligence, or selfishness, prevents us from following those examples of Beneficence which He gives us ? His ways indeed are not as our ways ; but were we to endeavour to make our conduct more like His, if only in this, human nature and human life would present far other aspects than they now do. Instead of charging with fanaticism or folly, what may appear vulgar or fanciful attempts to illustrate His goodness, let us rather labour to do as He has done, and, equally careless of the ingratitude with which it is received, to persevere in beneficence. Little indeed it is that we can effect : but it were well that we even desired to do for each other, what He has done from the beginning, and is continually doing for us, ever thoughtless and ever ungrateful.

Are there superfluities, sources of pure pleasure, luxuries, provided for us in these appointments, as in all else ? The latter term possesses a vulgar association with what is vicious or forbidden, as do even the former, in minds tinged with asceticism. But he who would separate pleasures from uses, would require to think more deeply than is usual on such subjects ; he who condemns luxury, has never thought at all ; and

he, the ascetic, forgets that the beneficence of God has not been limited to the mere supply of needful wants. It is not from him, at least, that reason or religion will take the character of the Universal Father.

In Granite, we find a stone so well calculated for durability, so beautiful and various, and so submissive to our tools, that it has been selected from the earliest periods of civilization, as the material for those works which record the power and knowledge of nations. Often too, their architecture is the only portion of their history which has descended to us: and if it is important for us to know under what forms man has preceded us, what he has thought, known, and done, what has been his political condition, what his astronomical knowledge, what his mechanical attainments, what his progress in the arts of taste, so intimately connected with his general mental cultivation, it is here that we must often seek this information, while thus also we often attain to know what his religion has been, under the strange forms which that has assumed. Can we then believe that even the luxury of architecture is unimportant in the eye of the Deity?

And if thoughtlessness should condemn the immense, and apparently useless labours of ancient Egypt, so are they easily condemned, under the use of the ever acceptable term tyranny, the ever ready word of him who abuses all the power which he can command. Yet he who would eat must labour: it is the unvarying law, not of God alone, but of human society; the bond by which it is held together. The soil of Egypt was the possession of its singular government; and the labour of the people was the only manner in which they could demand or acquire a share of the produce: it was the only mode in which they ought to have possessed their

portions. There is reason to believe that the soil had appropriated all the labour applicable to it ; and commercial industry, as it then was, had probably done the same. An artificial invention to occupy labour, became therefore imperiously necessary ; and through this was Egypt peopled, to an extent which seems to have been very great. The bearing of this fact on other cases here noticed, where, under a general law pervading all creation, conditions of labour have been attached to possession, must be obvious : and though tyranny had been the immediate cause, even thus does the Deity often direct the wickedness of man to his own good ends.

Sandstone demands no particular remarks : but had the fissility of Slate not been known, it would scarcely have been credited, especially by those who know that it does not occur in consequence of its stratified disposition. That rock was once a solid mass of clay, deposited horizontally, in slow succession, and afterwards indurated. It should have separated into leaves, as the shales do, in the same direction in which it was deposited, if it was to split at all : and there is therefore no contingency in the present very different result. The law is a peculiar one : whether intended for the useful end, others may judge. It is not however the exception which it has been called. Let no one ever perplex or suppress the truth, above all, in questions of the present nature. The same law acts in other rocks, but nowhere to the production of so perfect an effect.

The former remarks on the preparations for Limestone, and on its progressive augmentation, supersede in a great measure, what might have found a place here. The contrivances are much more remarkable than even in the case of coal, and they are acting daily under our

eyes, both for present and future purposes. And if animal life here contributes in more than one mode thus are ultimately beneficent ends attained, through means involving a primary mass of beneficence which defies all means of estimate, in the granting of happiness with life to uncountable myriads of beings, through ages which we vainly attempt to conjecture. If it is now superfluous to speak of the uses of this rock in architecture, I may at least note, that they depend on a combination of chemical arrangements which we had no right to expect, and have not long discovered. That the usual reflections might be made on this fact, and on the ornamental limestones, I need not say.

To terminate this chapter : It has been among the designs of the Creator, to confer on Clay, the property of being converted into stone by the aid of heat : while under a variety of appointments in the constitution of these earths, we possess all the uses derived from brick upwards to porcelain. If these varieties are such that we could not have expected them, from the exceeding simplicity of the composition, so is it remarkable that we must depend on nature for the greater number of them, though possessed of the ingredients, and of the means of analyzing these natural compounds. Every one knows how difficult it has proved to rival the porcelains of China, and that the ancient pottery of Greece is hitherto inimitable.

Indispensable as this property, and the arts derived from it, are to those countries which are deprived of stone, which nevertheless, from this very cause, their alluvial nature, with their consequent fertility, have been the earliest and the most crowded seats of civilized man, so is it in those, that the substances in question abound most, as the art of converting them into stone

seems coeval with man himself. Still more remarkable may it be considered, that in the most ancient and noted of all inhabited lands, the clay deposited by its great river is convertible into brick by the mere power of the sun; without which peculiar appointment and command, Nineveh and Babylon would scarcely have been; while these great cities occupy a space and a time far too important in the history of man, to permit us to doubt that they were ordained: they, and the very means of their erection and existence. On so apparently insignificant a property in an insignificant earth, the refuse of the mountains, the produce of apparent casualty, the deposit from a river breaking its seemingly appointed bounds, have been founded the greatest and the most powerful, as the most ancient of empires, producing all those extraordinary consequences, which, but for this, could never have existed. Can the hand of the Creator be seen in this? Let the reader conclude for himself.

On the variety of arts, the mass of industry, the production of wealth, the uncountable uses consequent on so apparently trivial a substance and simple a property, I need not dwell. Yet in dismissing this subject I must remark, that to the singular indestructibility of this artificial stone, a property possessed by scarcely any natural rock, we owe, as we do to architecture, much historical knowledge that would otherwise have irreparably perished. Hence alone, nearly, is it, that we can still trace the great Babylon, perhaps the remains of that very tower whose history forms so remarkable an era in that of mankind. To this we long owed the only knowledge we had, of a perished written language, perhaps of the language used by the earliest races of man. To this also we owe much

of what has been rescued for us in the arts of Greece and Etruria: and thus has one of the most apparently frail, as fragile, productions of human art, become the most unexpectedly durable of the records of nations.

CHAPTER XLVI.

ON THE PLEASURES PROVIDED THROUGH THE SENSES
OF ODOUR AND TASTE.

THE same vexatious prejudices follow us, in continuing to inquire into the facts through which God has displayed his goodness to man: The details are minute, the objects are mean, their purposes are trifling, or they are luxuries or superfluities ; or, under false views of His character and intentions, commonly from those latent seeds of asceticism which I have just noticed, we look on the gratifications or uses we derive from them as vicious, as things which He could not have ordered or permitted, but which we have discovered and applied, in disobedience to His will. Or, thus at least is a sense of impropriety apt to arise, from associating the name of the Deity with such details ; nor is it indeed easy to write on this subject, without fearing that this impression, however unjust, may sometimes be made on others.

Yet this ought not to be ; nor will a truly pious mind feel thus, impressed, as it must be, with a thorough conviction of God's goodness, and rationally believing that He has placed in this world, nothing capable of affording enjoyment to man, which he did not design him to enjoy : laying on him the check, alone, of a rational self-restraint, and furnishing him with know-

ledge and reason for the exertion of that prudence, the neglect of which would convert designed good into unintended evil.

We so seldom reflect on the immediate enjoyments which we derive through our senses, or on the innumerable other sources of pleasure, or happiness, which reach us, more circuitously, through the various properties and applications of created things, that an attempt at enumeration would surprise the reader unaccustomed to those thoughts. From habit, from want of reflection, and from want of an active piety, rather than from any impiety, we look on all these as contingencies or necessities : or as benefits attained through our own discernment and industry, without any specific intention, not simply without any good and kind one, on the part of the Creator : in the gift, forgetting that there is a Giver. Nor is it perhaps easy to avoid this grievous fault. Yet if a firm and habitual piety is the true corrective, I am willing, for the present, to make the appeal to pure and cool philosophical reflection. I am much mistaken, if, even thus, the result will not be to conclude, that neither chance nor contingency, but the Supreme disposing power, has intended and produced all these things, under specific and designed properties ; creating also the senses by which they could be distinguished, with faculties, and further with desires, through which man might convert them into sources of enjoyment for himself. Such is the course of argument which this work demands : it is to influence the moral man through the rational one.

Of those properties of bodies which do not refer simply and primarily to our senses, I have noticed many in the last chapter. But there are many others, recognizable by those, and often, in no other manner,

if we have sometimes collateral proofs of their existence, by means of chemical or other actions independent of sense in the usual application of that term. We are sure that these substances and their properties were created, or they could not exist: and that the senses were also formed with the powers of recognizing them, by Him who formed all things. And where the properties are such, and the distinctions so slender, that nothing but a sense can discover the one or discriminate the others, where the bodies themselves are not merely beyond the power of chemical analysis or assignment, but without weight, bulk, substance,—undistinguishable by aught but the particular sense appointed to distinguish them, the inevitable conclusion follows, that not only was the substance or distinction made for the sake of the sense, but that this also was created for the other: as, without this latter, the substance need never have existed.

Here there are a thousand substances and properties, created for the sake of one, sole, relation: it is an adaptation so exact, that it is impossible not to see that it was intended, even to its minutest applications. Nor is this all: since I shall soon prove that many of those substances or properties have been created, specifically, for the senses of man alone, and therefore for his sole use. That this should have been sometimes equally done for other animals, does not alter the nature of the argument; it is only extending the principle and the action of the Divine beneficence: but as it would be endless to pursue this inquiry all through creation, these remarks must be limited to the case of man.

If this general view, incontrovertible by the strictest philosophy, does not set aside all chance, or absence of intention, I do not see how we can ever infer our own

intentions, even in those most pointed cases, where the adaptations of one thing to another have been made by ourselves, personally, with the full consciousness of our own work and purposes. The case of the Deity is indeed more remote, obscure, and involved : yet the ground of inference is exactly the same ; as thus only we shall ever be able, in any case, to reason on His conduct, or hope to gain any knowledge of His mind. We may indeed admit, that this could be acquired through a positive revelation : but where we experience that so many refuse all testimony on this subject, nothing but one that should be personal, visible, audible, could give the desired demonstration ; while, under the refusal of testimony, it must be given to every man, or repeated on every day. To such conclusions are we reduced, when we refuse those proofs which the least consideration must show to be the only ones we can ever expect, as long as the present relations between the Creator and His creation shall subsist.

Under the question of the beneficence of the Deity, it remains to ask, whether man does derive enjoyments from these appointments, and whether they serve any other purpose. It is not the question, whether he always does this ; because the great sources of occasional exception, or casual evil, are admitted. Inconveniences or pain may follow, both from the properties of those substances and the possession of these powers : to suppose that these were not permitted, as well as foreseen, is to suppose a world on which no one has yet presumed. And when such consequences do occur, mere philosophy will point out why they were inseparable : how one property is necessarily associated with another, or how one effect may be good and evil both, according to its application, as in the case of a sharp

tool ; as also, how sensibility to pleasure could not have been separated from the possibility of pain, or was necessarily subject to exhaustion, inasmuch as the nervous power is exhaustible, and can only be replaced, like all else of the animal machine, through the medium of the blood. Notwithstanding all this, the answer will be in the affirmative. The properties in question are the acknowledged sources of pleasure ; and the instruments are the means. Nor can we discover that any other ends are served by those inappreciable, imponderable substances, which excite the finer sense of taste, and that of odour. But I must not prolong these general remarks, in a work of which I regret the shortness in every page, as I shall regret the length when the last line has been written.

Details on the subject of food, under the question of the sense of taste, might easily become overpowering. I can but give a slender sketch of what seems to refer to pure pleasure, confining myself also to man ; though it would be easy to show the same beneficent intention as to other animals. Even here I must be cautious, such are our associations and prejudices on this subject : but if it is thence difficult to treat it with the dignity needful under the present views, the Pythagorean indifference of the writer should at least exempt him from any charge of undue bias towards it. A late metaphysician indeed, writing on this subject, has spoken with contempt of the pleasures of the senses : thus pronouncing a judgment which would nullify all our conclusions respecting the beneficence of the Deity, as grounded on these provisions. It surely cannot require an answer, as far as the pleasures derived through seeing and hearing are concerned : while he must as surely have forgotten, that those which are derived

from the exertion of the intellectual faculties alone, are very limited, and that, were they the only ones allotted to man, the range of the Deity's beneficence would be singularly contracted. If, inadvertently, he meant only to exclude the pleasures derived from the senses of touch, smell, and taste, probably however having the latter only in his views, his conclusion is injurious, as it is unfounded. In all animals except man, the pleasure of eating, including smell possibly with taste, appears the chief or almost the only one provided : the act is the main occupation and pursuit, as it is the great and constant pleasure, of the individual. And though a false refinement, which is often but affectation, may scorn it in ourselves, it is a philosophical truth, that this forms a very large portion of the most permanent pleasures of the largest part of mankind : while if often forgotten or denied, it is because we overlook what is certain and frequent, as we do all other blessings, or do not choose to acknowledge what brings us down, in our own estimation, from that loftiness of mental pride to which we aspire. The metaphysician himself, whom disease, or imprisonment, or poverty, or famine, should deprive of this pleasure, would soon feel, if he would not confess, that the fact was at variance with the elegance of his hypothesis.

Food was appointed to be a necessity to man, as to all animals ; and we can also admit that it was necessary to have appointed two kinds, the animal and the vegetable, as essential to the health and activity of a species whose structure demonstrates the intention at least. But it was not necessary that so many kinds of animals and vegetables should have possessed different tastes, even though possessing variety of substance and form. Or, though it also were deemed in-

evitable that such variety must have been attended by differences of quality, we need not have had organs capable of distinguishing them all; as, still farther, there was no necessity why any of them should have been sources of pleasure. Where many are not such, none need have been: while the likings and the aversions of different animals to one substance, with the great variety of the affections on this subject, prove an arbitrary appointment, through which corresponding sources of pleasure have been ordained for all, independently of the mere instinct towards food. If all this is purely gratuitous, it evinces beneficence: since the mere stimulus of hunger would have answered all the purposes of utility. And where organs of sense have been given, not merely to discriminate all those delicate properties and differences in animals and vegetables which chemistry can neither analyze nor conjecture, but to derive enjoyment from them, we must believe that they have been invented or created for this very purpose, as will appear more clearly when I come to investigate the contrivance for fruits.

In the quadrupeds, under a common structure and chemical compound, feeding also on a common food, this variety of properties is familiar: and it is not less so in the birds, where we can ensure an identical food, under domestication. This is not less remarkable in the fishes, where little variety of food exists for any, and none for the predaceous ones; since the objects of prey are promiscuous, be their qualities what they may. These differences are inexplicable, under a common ultimate organization, a common food, and a common chemistry of life. The provision for those differences is at least abstruse: and judging by our own knowledge, we must suppose it to have been difficult: while it is not the result of chance, since, under casual differ-

ences, easily explained, it is constant. The obvious conclusion I need not again draw.

The more insipid vegetables admit of the same general remarks. In those of more decided qualities, chemistry does at least approach so near, as to ascertain the particular secretion or substance in which the taste resides, though it cannot separate the principle itself. In those therefore, we see distinctly, that there has been a preparation, which we can only conjecture in the former. We find a system of secretory vessels appointed to form the very substance, and proving therefore that a special structure had been arranged for it: while these vessels and their products are different in different plants, and further, are superfluities, or things unnecessary to the existence of the plant itself. And if thus useless to it, so do we often find this produce useless to other animals, or else disliked by them, and useless also for any other purpose than our own pleasure. Why therefore not conclude that this was the design? I need not illustrate by examples. The reader's recollections can range from rice or wheat to cinnamon or pepper, the former belonging to those where chemistry cannot secure the specific source of taste, and the latter furnishing examples where it is easily separated, and where the special organs for its production can also be assigned.

I must here also mark one appointment respecting the organ of taste, whence a source of pleasure is opened with very little of apparent preparation. This is, the gratification produced by substances which seem to make very little impression on the sense, while it was perhaps convenient or necessary that the greater number should have been of this nature: just as that power in the organ which enables it to appreciate the

most trivial differences, is a source of pleasure, of which we are at least fully aware when we observe the insensibility of others, or have lost this nice perception through disease. And if we should have inferred, that strong impressions and decided distinctions ought to have been the most gratifying, so might we have concluded that habit would have led to distaste or insensibility, and to the latter, especially, where the impressions were most feeble. But the greater, and also the least palling pleasures, arise from the weakest impressions and the most trivial distinctions ; as if the organ and its corresponding pleasures had been made to conform to what might not easily or conveniently have been otherwise. The needful illustrations of this also, I must leave to the reader : their familiarity renders it unnecessary to detail what that very familiarity also might make it difficult to explain, without exciting associations better kept out of sight in this place.

The fruits constitute a very peculiar set of productions, united by a common bond ; in a certain sense, superfluous to us, and sources of pleasure ; while being connected by one set of chemical principles, they better admit of many of the needful remarks, than the miscellaneous mass which has preceded. And, if appealing to common experience, they do not excite the unpleasing or inconvenient associations which many things in the former wide catalogue might have done.

It is true, that many of these may be viewed as originally designed for food alone, as many roots have been ; but I need not here consider them in this light, nor point out their salutary, medicinal, or other useful qualities ; since the present inquiry is limited to superfluities, or pure sources of pleasure. Yet there are two general facts relating to fruits which must not be

passed over ; because while no opportunity has occurred of even noticing one of them, they must be regarded as special efforts of Beneficence, whether the results belong to food, health, or pleasure.

The most remarkable of these is the succession in which they have been destined to appear, and it will be most striking to him who shall consider it as a philosophical botanist. It is opposed to the inferences which science would have made before experience ; while, being known, it defies all explanation. Like so much more, we must view it as an arbitrary law, or as the Will of God ; acting, by whatever means it does act, for the good of His creatures.

Of many fruits at least, the nature is necessarily transitory. They are always connected in some manner with the seeds, which must often be dispersed as soon as they arrive at maturity, that the plant may be perpetuated. Or they are particular portions of the whole fructification, which must, from its very nature, have soon perished : while, in other cases, they could not but partake of the temporary duration of the whole vegetable, or are such, that their value and uses depend on a constitution, both organic and chemical, which is of necessity perishable. What then would have happened had all plants produced their fruits at the same period ; as we might have expected, knowing that heat is the cause of their production and their ripening ? They could not have been consumed : we should have been overwhelmed with them for one short period, and, through the rest of the year we should have wanted. And accordingly, as in flowers, where this arrangement is more purely conducive to pleasure, they have been commanded to appear in succession, so that as one vanishes, another is ready to supply its place. We

profit by this, even in our own short summer : it is more extensively the fact in tropical climates, where these productions are far more numerous, and their uses, both to man and animals, much greater. And if, in our limited summers, these fruits must be equally limited, so is it contrived that the want, the necessity or the utility, and almost the enjoyment, should keep pace with the means. Under our artificial habits, this cannot be rigidly exact : but the general truth is sufficiently familiar.

The other fact to which I alluded, conduces to the same good ends. All fruits are not transitory, or perishable, so as to demand immediate consumption. On the contrary, we find in them the greatest variety ; from an immediate urgency to be used as soon as they are perfect, to a power of delay which enables us to preserve them through an entire year, till a new summer comes, to recommence the same round. And so admirably have the provisions for this been appointed, that many will not ripen on the parent tree : a fact which, familiar as it is, offers no small difficulty, both in vegetable and ordinary chemistry. Did the organic chemistry not continue to act, the fruit would rot, since this is the invariable result of that agent when life has left those organizations. The stored Apple is not less alive than its seeds : its principle of vitality remains, one of those inexplicable detachments, like the slip, from the general life, and it continues to act on the fluids which the vessels contain, through those vital powers which equally directed the organic chemistry before. Thus does it convert the malic acid into sugar, and thus many other similar conversions are effected ; not one of which, extra-organic, or common chemistry has yet been able to perform, however it may lately

have approximated to some ; yet by means through which the plant or fruit could not have acted.

In this and other modes, have provisions been thus made for preserving fruits and continuing their useful succession ; while the most universal of these is a constitution which renders them naturally durable ; often, without any effort of our own, and, at other times, under some assistance from art. And this provision, like the former, extends its influence very widely. The constitution of the globe did not allow of an equal climate or summer to all the world, though man is permitted to dwell everywhere. Commerce, equalizing in a great measure this necessarily partial distribution, causes the inconvenience, even in the present instance, to be little felt. In the latter case, where the constitution of the fruit is naturally durable, as in the Date for example, there is nothing to excite peculiar notice, more than in other instances of analogous commerce. But there is a contrivance in some of the perishable, or truly summer fruits of the hot climates, which must not be passed over : enabling them, not only to be preserved, but transported far and wide ; adding to the wealth of those who produce, and to the enjoyment of those who consume, as they also add to the wealth, even of the latter, by stimulating labour. The Lemon and the Orange ripen, like the Apple, at a distant time, without the aid of the parent tree or the parent climate, without light and without heat ; giving us, in the regions of snow, all that we could have derived from a tropical sun. An object so familiar is, as usual, little considered : but, independently of this power of delay, of the extraordinary conversion of citric acid into sugar, in this little and strange laboratory, and of an investment which, appointed for the defence of the interior, is

moreover so contrived that it shall furnish the greatest resistance when that was most needed, he who is still ignorant must be taught to admire the beautiful mechanism, elsewhere pointed out, through which the enclosed fluid is preserved, under a great chemical difficulty. Had the exterior structure included a fluid only, as the Cocoa nut does, and as, to all of its immediately useful purposes, it might have done, this must have fallen into fermentation, as chemistry well knows. Yet that has been guarded against, and in the exact manner which this science would have suggested. Each compartment is so small, that fermentation cannot take place: while it is not unlikely that this very law, so unexpected under our general knowledge of this process, was appointed for such and similar ends. Nor was this structure necessary, as regards either the vegetable or the produce. The fluid might have been secreted as that of the Cocoa nut is; it would have been equally useful to those who possessed the tree, but its wider uses would have been unattainable.

I may turn to the further provision for preservation and transportation which has been made through drying; most often, but not necessarily, demanding the assistance of art. Thus do the Fig, and the Date, and the Grape, almost preserve themselves; as many others require but little aid from our own industry, while the means are thus pointed out to us by nature. If Arabia would be uninhabited without the camel, so might it but for the date: while the properties of both, equally, are such as man would have given, had he possessed the power with the inventive faculty. But the fundamental provision for this, is laid in that of sugar: a substance deserving peculiar notice, not only as an article of food, or a source of enjoyment more uni-

versally allotted to animals than any other of the productions affecting the sense of taste, but because of its remarkable chemical properties, directed, we can scarcely doubt, essentially, to the ends here under review. Incapable of change itself, it preserves, not merely the vegetable, but even the animal organizations from chemical destruction: and thence also, where nature has not added it to the fruits in sufficient quantity, is art enabled to supply it, with the same useful results, in modes which are as familiar as they are numerous.

To return now to the consideration of the fruits themselves, it is necessary first to remark, that although appendages to the seeds, in some manner, they are not essential to those, or to the perpetuation of the plant. And being superfluities, we must conclude that they were superadded for an extraneous purpose, indicated with sufficient clearness by the uses or pleasures which they afford to us. Had this superfluity however always been of the same nature, or had every fruit constituted the same portion of the fructification, we might still have imagined some necessity as to the plant itself, or attributed the whole to some needful vegetable arrangement. The present variety is hostile to such a conclusion, and unites with the fact of the superfluity, in leading to that which I have here drawn. I must therefore give a slight sketch of the botanical nature of fruits, though, on so extensive a subject, limiting myself to familiar, and nearly to domestic examples.

In the Strawberry, the fruit is the receptacle; a spongy substance with an expanded surface, to which the seeds are attached superficially. Though in a very different class, and with a very different law as to the relation between the flower and the seed, it is a similar

part which sustains the seeds in the thistle and dandelion. The analogy of these, as of many in the same division with itself, shows that however the receptacle was necessary to the Strawberry, it need not have become a fruit. The dry receptacle of a Thistle is equally efficacious to the support and protection of the seeds. The Pine-apple may be associated with this, if not with botanical accuracy. Here, a whole plant has been occupied in producing a single fruit, almost as large as itself; while it is an entire superfluity, and also a very operose arrangement compared to the fruit of the strawberry. And as if it had been foreseen that the use of the fruit would destroy the seeds, in both, each plant, as I formerly remarked, has been enabled to continue itself by voluntary offsets, and the latter, further, by that obstinately vital production the crown, which the consumer of the fruit would be troubled to destroy, as its offensive nature makes him gladly throw it away. That the intention is thus further proved, I need not say.

The Acinus of botanists constitutes the basis of another class of fruits, and the Raspberry is a familiar example. In this case there are more seeds than one connected with the superfluous structure which constitutes the fruit; while the smallness of the receptacles for the juice serves the same purposes as the bottles in the orange. And as there are dry acini, just as there are dry receptacles in some plants, of which the American raspberry is a familiar example, the conclusion is the same in both cases. If the instance here selected is an example of a perishable fruit, the acini in the Pomegranate are protected by a covering of great strength, conferring a power of preservation and transportation, even greater than that allotted to the orange.

The Berries form a far larger and much more various class of fruits, as a more minute examination of them than I can here afford would also be interesting. It is here equally easy to convince ourselves that the fruit is a pure superfluity. The number of dry, or insipid, or disagreeable berries, is far greater than that of the others, while the uses to the seeds are equally served, whether the object of these be simply perpetuation or use to animals. And, in these there are more contrivances than one, for effecting that which is attained through the division of the juice in the orange and in the raspberry. There is often a distinct mechanical separation, not only tending to prevent fermentation, but to confer firmness on a fluid. In others, that structure is so minute that it is not easily detected : consisting of a delicate cellular organization, resembling that of the vitreous humour of the eye, and equally giving to the watery fluid the aspect of a jelly or a mucilage. And in other instances again, there is a gelatinous or mucilaginous substance united to the acid juice ; which, by preventing the intestine motions of the fluids, equally checks fermentation, as it also aids in producing that necessary solidity which the protecting investiture alone would not have accomplished.

The Grape, the Gooseberry, and the Currant, are instances under this head which I need scarcely extend : but it is interesting to remark that where the berry is small, as in the red currant for example, these provisions for solidity, and against fermentation, are nearly or comparatively dispensed with ; just as they are in the acini, and in the orange, where there is little mucilage and no cellular structure. And if the intention of these several inventions is thus proved, thus also do we discover, as in endless other instances, that

creation does not indulge in useless superfluities, and that the same end is obtained through variety of contrivance. But if I might easily enlarge on this division of the fruits, under the various views, mechanical, chemical, and botanical, which it presents, even to the enveloping enclosure, often highly worthy of admiration, the investigations are sufficiently easy, as the general principles of botany are familiar; though this science, concerning itself chiefly with nomenclature, is too apt to forget this more interesting branch of its pursuits.

The Apple furnishes a familiar model for another class of fruits, though the variety under it is very limited. If this structure should be considered as a mere protection for the seeds, it would be a very superfluous one; and the real intention is not less visible. In the case of the Cashew, externally resembling the apple, if botanically differing, the fruit is an absolute superfluity; since it does not even enclose the otherwise fully protected seed. If the cellular structure of these fruits, of which I spoke on a former occasion, checks fermentation, as in the former cases, while conferring an almost incredible firmness, when the small proportion of solid matter is considered, there is a further provision for the preservation of the Apple at least, through that exudation, too often carelessly removed, which, by forming a varnish, excludes one of the most active causes of destruction. The strength and compactness of the very thin, yet secure epidermis by which these fruits are protected, ought also not to pass unnoticed.

The Cherry and the Peach are examples under that class of fruits which botany terms a Drupa. Here, the superfluity is very striking, because the seed is com-

pletely protected by the stone. For all purposes to this essential part, every drupa might have been a filbert, or at least a walnut, where the external covering is not a fruit. And here also we must admire that cellular structure through which the purposes already named are accomplished : while, in the Peach in particular, the firmness is exceedingly remarkable, when the actual quantity of fluid in the total bulk is considered. And it must not be forgotten, that in every one of these instances, this often apparently impossible problem has been solved for purposes of utility ; if also variously solved, as if to evince resource. A fluid was the thing to be produced : but that was to be rendered transportable and durable : and, by means that almost appear magical, it has been made to assume the form of a hard and resisting solid.

Thus passing the bounds of our familiar experience, I must quit this branch of the present subject, though the botanical reader can easily extend the same reasonings to the fruits of other climates : among which the Tamarind and the Locust, at least, are familiar to every one ; while the superfluity in these is also remarkable, since it is the juice serving no end to the seeds which it involves or the siliqua in which it is contained. I may proceed to ask, on further grounds, whether the design cannot be brought to bear on man more closely, and still more accurately on his pleasures than his wants.

The general principle of all the fruits which seem intended chiefly for gratification, is chemically simple and uniform. As far as mere taste is concerned, it consists in all, fundamentally, of a mixture of sugar and acid, differently proportioned, and more or less diluted. The Orange alone will, at different stages of ripeness, illustrate these differences ; as the red Currant

and the Greengage plum are, in our own fruits, examples at the opposed extremes. Speaking however with chemical rigidity, the sugar is not always that of the sugar cane : in the Fig and the Date for example, it approaches in quality to manna. The acid portion appears to comprise many more acids than chemistry has yet ascertained : but it is familiar with at least the malic, oxalic, citric, and tartaric ; while, as far as our experience goes, the two last appear to be the most general. The mucilage, constituting the only other general principle, seems only to modify the taste of these compounds ; or, like water, may be considered as a diluent, otherwise at least than as it is a nutritive substance. In the Fig, this forms a very large ingredient : if it abounds in some Grapes, it is nearly wanting in others ; and, in the Orange, as I already remarked, the quantity is still more minute. This then is all : sugar, acid, mucilage, or jelly, and water : and as these variously prevail, we have all the range of quality in fruits from the thin acid Currant, to that beautiful proportion which constitutes the Grape, to the powerful mixture of sugar and acid in the Pine-apple, and the almost total absence of the latter in the Fig. 55

Even thus far, we might fairly suppose an intention of beneficence, in the varieties of taste thus produced : as all the useful qualities might have existed under one variety, just as the nutritious properties might have excluded, not only variety, but taste itself. This however is far from all that has been done for our pleasure : since there yet remains to be noticed that most mysterious compound, or set of substances, forming the principle of flavour ; of which chemistry can give no account, transcending as they do, and perhaps ever will, our power of analysis. Be they what they may, they

have been ordained and provided ; while their relations to the sense of taste so as to produce pleasurable impressions, must, as I formerly remarked, be arbitrary, or solely dependent on the intention and command of the Creator. We are not indeed sure that the whole of these peculiar provisions have been made for man alone. It would be indifferent as to the present argument, though other animals partook with us of these enjoyments; but the indifference or distaste which they show to the flavours and odours which we enjoy, with their frequent attachment to those which are disagreeable to us, point out, in those cases at least, that the beneficent appointment has been especially intended for man. I need scarcely perhaps say, that odour and flavour are but the same, nor draw the distinction between flavour and taste : the impression is similar, and, from the same substance, both senses appear to us similarly affected ; while it is physiologically probable, that the sense of flavour is perceived by the nerves of smell, and not by the tongue as the organ of taste.

And it is through the principle of flavour, that there has been produced a far greater range of variety in fruits, than any modifications of their fundamental elements could have effected ; while it is through this also, that all that delicacy of quality which attracts us most in these productions, has been conferred. No power but the Highest could have created what it passes human imagination to conceive, as well as human knowledge to assign ; and no wisdom but His could, through the addition of things imponderable, inseparable, unintelligible, have wrought out such a variety of ends. Deprive the finest fruits of their flavour, and they are nothing : sweet, sour, and mucilaginous. Such is often the result of our imperfect

climate; and thus, even the Peach falls beneath the apple. Without this, the Cheremoya and the Mango-steen would be nothing: as the Pineapple might almost be represented by a mixture of our own making.

And has not all this superfluity, so varied, so constant, so delicate, so difficult to understand, been appointed for us and for our pleasures? Has it not been appointed by Him, the powerful as the beneficent, when it is all the result of organizations so minute and abstruse, and of chemical actions so obscure and so wonderful, that all equally eludes our faculties and confounds our reasonings? Chance, it is not; and it is not necessity: for all other animals, it is purposeless: it is a source of enjoyment to us: and whence then again, in the words of Seneca, are the pleasures which we do enjoy, if God has not given them, if He did not thus provide for our happiness? Yes, even in things so minute and so low as this; which we must not shun to think of, from false or affected views of Him, to whom man, altogether, is as the gnat of a day's life, equally under His care and protection, lest it should lack its food and its happiness, and fail in its generations. Between Him, the infinite, and all beneath, all distances are alike: He watches indeed over the eternal welfare of man; but He also feeds the raven, and protects the sparrow. He has told us so: it is not impiety which strives to view Him in everything: it is not piety nor religion that would exclude Him from anything.

I cannot however quit this part of the subject without some notice of the Grape, as a special object of interest to man, and to him exclusively. How often it is alluded to, in the writings of Divine origin, as being no less a gift to him than the most essential articles of food, I

need not say. But all the world has known from all times, that its familiar produce is as useful, as the instinctive desire for it is universal, under the inducement of immediate enjoyment. Like all else, indeed, it is liable to abuse, with consequent evil: but a sound philosophy, justly despising the caprices of ever-changing medical opinions, with that fanaticism which, in condemning its use, would restrict industry and destroy the value of soils otherwise worthless, can assign ample reasons for its utility; as a rational study of the constitution of the human mind, and of the conditions of the mental powers and the feelings, under the casualties of life, can no less defend and explain its moral value, independently of the mere enjoyment resulting from its use. And if the grape seems to have been peculiarly contrived for a purpose less easily attainable than otherwise, through a constitution not less remarkable than the wide diffusion of the plant and the abundance of its produce, while, further, so declaring its own uses, that man could scarcely have known it without discovering that it was ready to produce wine, it is not possible to doubt that it was appointed and destined for him to whom alone it is useful, or even acceptable; and that it really is what we have been assured, one of the especially beneficent gifts of a bountiful Creator. Of the numerous and unexpected varieties of this produce, the result of human industry, I can but remark what I have done of the cultivation of fruits in this chapter; though the case is even a stronger one than that which I have selected for those observations.

If more could be necessary towards establishing the peculiar care of God for the human race in the invention of fruits, the following general fact must set the question entirely at rest. That the means of procuring

enjoyment have been very generally rendered dependent on man's own industry, and on that accumulation of knowledge through his races which is the result of successive and continuous industry, has been often here shown. And when he thus produces any specific source of enjoyment, we must believe that it was designed, because the general result was intended. The laws of nature, as they are termed, have, to a certain degree, been left at his disposal : he is allowed to change the ordinary course of Creation for his own profit. Had that not been permitted, or rather intended, it could not have been : and we are assured that it has, when the consequences, forming man's stimulus, are the reward of his exertions. And if, in any case, we find that latent provisions have been made for the production of what would, still, never have occurred but through his assistance, much more must we believe that the intention was for him, even under a double design of beneficence ; since the needful exertions were essential, equally, to his physical welfare and his moral improvement.

I have detailed the facts here in question, at some length, in a preceding chapter (c. 19), in showing that he is thus enabled to change the characters and qualities of vegetables for his own purposes, so as to be almost the creator of new species and previously unknown substances. In the case of fruits, this is especially remarkable : and, perhaps even more remarkably, the effect of the appointment is such, that these new results and gifts are allotted peculiarly to civilized man, and keep pace with his civilization ; to the progress of which they consequently form a stimulus, with a continuous increase of good effects. This is very beautiful ; as is all else of the physical and

moral contrivance under the Divine government ; often as our want of reflection, or our neglect of Him who thus governs all things, blinds us to that beauty and that wisdom. But the reader must reflect for himself on all that follows so simple an effort as that of converting an useless wilding into a plum or peach, in the arts which it invents and extends, the knowledge which it enlarges, the wealth which it circulates, the consequent involved industry which it stimulates, and far more than I need or ought to detail. And if the rude metallic ore was placed in the earth for man, while all else was left to his own industry, as little can we doubt that as the fruit would never have existed but for his exertions, so was the intention for him, under the specific design of beneficence. Much indeed has been given in a perfect state : and not perhaps as the necessary result of climate, but because man was there first placed, still ignorant and comparatively helpless ; as it was doubtless foreseen, and possibly intended, for some purposes unknown to us, that he should there make a slow progress, or long remain in a state of comparative rudeness : while we cannot but see, that this condition is the result of arrangements which so widely dispense with his exertions and industry.

I may conclude this division of the present chapter, with a general remark on the sense of Taste. In the inferior animals, very widely, those of vision and hearing are more powerful than in ourselves, and the latter, as I have elsewhere shown, appears also to be more discriminating to sounds, while, in some, the sense of smelling is not less superior in acuteness. But in all these cases, it does not equally follow that the same extent of uses or pleasures is derived, as we enjoy from our less perfect ones. These powers were necessary

for special, but limited uses, in each case : but the extent of those uses depends on intellect and knowledge ; while the appointment of pleasure is, as I have here shown, arbitrary. The eye of the eagle does not discern the landscapes of nature or the beauties of flowers ; the dog takes no pleasure in their odours. Thence, even as those senses are concerned, the pleasures and uses enjoyed by man, not only may be, but assuredly are, far greater than those allotted to any animal, though with inferior powers in the organs themselves.

But as the sense of taste is concerned, he not only enjoys the same superiority, from the same causes, but excels thousands of species in the organization itself ; while we further see that it is the effect of cultivation or civilization to increase this power and discrimination, and thus to augment the pleasures derivable from it ; leading to those obvious moral conclusions which I need not again draw. The former facts are obvious all through creation, and especially so in the birds and the fishes, which can have little or no taste, where also the mode of feeding proves either the absence of this sense, and of the pleasures belonging to it, or their small value. And the latter is equally proved by the conduct of savage or uncultivated man, devouring, like the beasts of prey, without discrimination, from the mere instinct to food. The sense of touch might be adduced for the same purpose of proving a peculiar allotment of pleasures and uses to man ; though there is nothing referable to that sense, which demands a detailed examination. There is not an animal in which it can exist as it does in him : while in very many, there can be no other but that which is provided for by limited and special organs, for purposes as special.

The reader who can cast his eye over creation, will not require the details which it would not here be convenient to give.

In proceeding to the sense of smelling, I need neither repeat the former remarks on the arbitrary law through which certain odours are appointed to be grateful, nor note its utility to man or animals. And I need but remark, generally, that the substances yielding odour, and the pleasures derived from them, seem to have been intended purely for man, as they either produce no impression on other animals, or are objects of aversion to them. But if those sources of odour are numerous, as they occur everywhere, I may here confine myself to the flowers ; to that department of creation, which, in the endless beauty and variety of its forms and colours, seems equally to have been provided for our own almost exclusive delight.

Like the flavours already discussed, with which indeed they seem identical, chemistry is utterly incompetent to discover in what the odours consist, even when it can ascertain that they reside in a peculiar secretion of the plant, the essential oil. They appear to be attached to those oils, not to be necessary parts of them ; since they exist independently of those substances, and can be artificially attached to other oils, though not discoverable in their separate state, except by the sense appointed to feel them.

And they are assuredly among the most marvellous substances in chemistry. The impressions which they make on the senses must be the produce of a substance which, as a vegetable secretion, is indeed indisputably such, while it is also a compound, since it can be decomposed or destroyed by other chemical compounds. The great extent to which they can be diffused, is

another proof of their substantial existence : while they also obey the common law of self-attraction, since they can be transported on the winds to distances of many miles. Yet they are imponderable, as imperceptible by everything but the special organ constructed to perceive them : appearing rather to be akin to light, than even to the gases ; since they fill no space, and offer no pressure or resistance. If we cannot ascertain that the flower loses no weight by giving out its odours, because the circulation of water through it impedes such observations, we knew that nothing sensible is lost by musk, though under a long-continued emission of its peculiar smell.

Substances so extraordinary, so diverse from the general chemical compounds of nature, so numerous and distinguished, yet so constantly and so permanently ordained to be produced, each by a particular flower, are not at least casual productions : since if anything in creation can be deemed to have done so, they seem to have demanded very specific exertions of power, as no power but that which created light could have accomplished aught so incomprehensible. The casualties of even chemistry, endless as those are, do not produce them : and there is assuredly no casualty in the flower which does this, when the result is as constant and precise as the very form of the plant, and the seed by which it is to be continued. In what these products and their endless differences can consist, chemistry seems for ever destined to seek in vain : yet being what they are, exertions of Divine power, superfluities to the plants themselves, superfluities to all else of creation, and sources of pleasure to us, how can we doubt that they were created for our enjoyment, that they are efforts of the purest beneficence ? Were they even said

not to be compounds, substances, but influences, as may perhaps be said of the odours of metals, where nothing seems to be evaporated, the same inferences would remain ; for the effects are still existent, and the exertion of power, as well as of intention, must have been similar.

And of this source of pleasure we can at least speak with a freedom and confidence scarcely permitted us on what concerns the organ of taste. It seems hardly even of a corporeal nature : as if it belonged rather to the pleasures of the imagination than to those of mere sense. It is at least the poetry of sense : and whatever impressions the other animals may receive from the same sources, we are sure, that in all its variety, and delicacy, and power of influencing the mind, it has been reserved for us ; a truly mental enjoyment, akin to those of poetry and of music. And, unlike so much more, the very sense is insatiable of these pleasures ; though becoming torpid to them under excess of exertion, through a necessary and universal law of the nervous energy. Nor is the indulgence which is unattended by satiety, followed by suffering or repentance. There is no pain, no evil consequence ; there is not even that moral evil which is, unhappily, so inseparable from the indulgence of almost every other gratification allotted to man. No rational morality has ever reprobated pleasures which the purest poetry has delighted in depicting and extolling : even attributing the power of yielding odours, in passages which were never yet censured, to the celestial intelligences of its sublime fictions.

Of sources of enjoyment and happiness like this at least, we cannot mistake the intention ; and as little can we doubt the goodness that appointed them : while far

more ought we to be grateful, in finding that we have not been permitted to abuse them to our own injury. Often do we lament, and often perhaps have we reason to regret, that in this mixed world, the good and the evil have been so intermingled, as to demand our utmost caution, the most rigid control over our passions and affections, even of our apparently most innocent, or even virtuous tendencies, to separate them : and shall we not then feel, that pleasures like these were indeed of His appointment, as we must surely believe that what a beneficent God has done in one

✓ thing, He might, and would, have done in all, had it been consistent with the plan of His government ?

Omitting all notice of the artificial perfumes, as of little interest compared to those which nature provides for us among her flowers, under an infinitely greater variety and delicacy, I need but appeal to the universal sense of mankind in favour of these. In the savage as in the civilized state, the whole world has ever agreed in acknowledging this source of delight ; enhanced as it also is, by the beauty and delicacy of the flowers to which those odours owe their origin. The love of these almost speaking and animated beings seems an instinctive passion in man, in every condition : it is remarkable even in infancy ; it breaks forth in the inhabitants of towns, in the rudest nations, and in the most unexpected circumstances : acting on the moral feelings themselves, on the affections and passions, in a manner that would scarcely be deemed possible from aught but the influences of humanity and human sympathy.

If the variety of these odours surpasses all enumeration, and almost all credibility, incredible even to chemistry as a single one would be, without expe-

rience, so in this, if there is resource, power, there is also beneficence. Variety alone is pleasure : it is a part of our constitution, that, in everything, repetition should pall on the senses. The odour which has ceased to be felt, is nothing, but a different one is ready, to renew the pleasure : the novelty itself is a pleasure, and that novelty is ever meeting us in the perfumes of flowers. It is a far more extensive variety than he who is not familiar with creation, not merely as its student, but almost as its worshipper, could conjecture : but would he derive from this simple, but not vulgar sense, all the pleasures which it can afford, he must seek them, not as mere gratifications of sense, but as objects of intimacy, connected with all of beauty and life and interest which belongs to them, with all of invention which the universe of flowers displays, and with the boundless associations which they are capable of exciting. The artificial perfume is but the sensual gratification of a poor voluptuary, compared to what he who knows and feels creation as it ought to be known and felt, derives from all which it offers, even in this limited but exquisite portion, to his mind and his heart rather than to his senses : which it offers, even in the slenderest odour of the new-springing forest, the freshness of the early morning, or the almost imperceptible perfume which marks the new summer, under the breezes of that season of joy. Spring, summer, sunshine, hope, joy, happiness, recollections or anticipations of delight, the warm feelings of youth and the innocent pleasures of careless childhood, the music of the forest and the brightness of the landscape, these, and more, are of the impressions and associations excited by the odours of flowers : and even thus also

has a kind Creator ordered, that these pleasures shall be pleasures for man, beyond all others of those beings which He has appointed.

But I must leave all this to details in which I cannot indulge, and to that poetry which I dare not approach. I have said enough for the real lover of nature, if not to impress him whose habits and thoughts, occupied on other and different pursuits, I cannot hope to influence. Thus insensible, he has lost much pleasure, and may yet redeem the time: should he fail in the attempt, let him be assured that creation is a sealed book to him. He is without the common instincts of his nature, or has forfeited them: he has perhaps debased his own mind by unworthy pursuits; or thus neglecting the bounties provided for him, he may at least suspect his moral feelings. But is there indeed one who, thus appealed to, does not acknowledge a Creator, the parent and giver of all this: whose heart does not respond to what he too often forgets to put into thoughts and words? If there be such an one, to him at least I have written in vain.

Can there be that man who shall take even a Rose into his hand, and not wonder as well as admire; not love as well as wonder; and not love the Giver as the gift? Beauty of form, beauty of colour, variety, through nature and through art, odours never wearying, gentle as sweet, and various as delicate, profusion of produce, a constitution through which it occupies all the year, and every climate on the globe, such is the queen of flowers, the ever admired and beloved, of the untutored as of the civilized, in all ages and throughout all the world. Even on this little flower has the finger of God written, in language that cannot be mis-

taken : In this too have I cared for you as for my children, even in this have I intended your happiness, as for that I have wrought in a thousand ways : will you not acknowledge it ; will you not at least learn to enjoy my blessings, that you may make the first step to the gratitude which is my due ?

CHAPTER XLVII.

ON THE PLEASURES PROVIDED THROUGH THE SENSE
OF SEEING. BEAUTY.

I HAVE shown in the last chapter, that although the less refined of the senses, taste and smell, have been given for purposes of utility, yet they have been so contrived as to be the means of much more, in the production of that superfluity of effect which constitutes pleasure, simply, and apart from any use, in the proper sense of that term. It has been not less clearly shown, that counter-provisions have been also made, in the qualities of natural objects, for the same purpose : that useless properties, under great variety, and implying a great train of inventions, have been appointed ; cognizable by nothing but those peculiar senses, and, when recognised by them, being sources of pleasure, and nothing else. If the final cause, therefore, or the intention of the Creator, cannot be doubted, when such a perfect adaptation between two inventions, of the most dissimilar and independent natures, is found to exist, existing for this purpose and no other, so ought we to conclude, that in every special instance, the appointment, or invention, was directed to that very end. In no case is there any necessity ; nor do these appointments belong to any train of laws or analogies, whence we might infer that they were not foreseen in their effects,

or were not intended for certain purposes. Therefore they are of an arbitrary nature; simple acts of the Creator's will: and thus, associated by no link but that of the final cause; good, or happiness, under the intention to produce happiness or good.

If I thus consider this, the Creator's will, to be the only philosophical basis on which we can examine all questions of this nature, I am about to apply it much more widely in considering the senses of seeing and hearing. That Will, in any case, implies an arbitrary law; since the terms are, in reality, equivalent. But when such a law can be widely traced to the production of many distinct effects, when philosophy can analyze these laws through analogies and actions, and when it can therefore assign secondary causes, it, not unnaturally, forgets the original cause, the Supreme will; while it is justifiably occupied, as philosophy, in the investigation of the modes by which this has proceeded. And thus will it start at the term arbitrary; of which, nevertheless, I must here make a large use: while I need not repeat, that it implies a reference to the Will of the Creator, as the sole cause which can be assigned for an effect, in the absence of any apparent secondary causes.

It is not surprising that philosophy should be startled at this term, or reject it; even where it does not refuse to acknowledge a Creator, and under every one of His attributes. Its business is with secondary causes: and to accept of the First Cause in lieu of these, is, as I have more than once remarked, to renounce its proper pursuits; as it is also to wound its own pride, in lowering itself to the level of mere ignorance. But this is a far more repulsive doctrine to that philosophy which would account for everything without the intervention of a

designing and purposing Creator ; which desires to think, that certain great acts of Will, alone, have been exerted, or some wide and simple laws only, appointed, and that all else is contingency, or necessity, apart from any foresight or intention.

Thence is it ever an unacceptable mode of reasoning ; as it also involves the equally disliked argument from final causes. Under both views, it is unacceptable : while, under the latter, it has been rendered additionally so, from those prejudices respecting final causes, on which I have spoken in the introductory chapter to this division. It is incorrect, however, to separate these : they are the same thing ; since intention implies a purpose : and if they have formed separate grounds of objection, it has been because some have refused to inquire after a First Cause, or have considered that philosophy had no concern with it ; while others have been averse to believe in a governing Creator, especially in things which they have imagined beneath His attention.

But, be this mode of reasoning as unacceptable as it may, I not only intend to use it, but think that it can be justified in a manner which philosophy will not easily answer, or will not be able successfully to dispute. If numerous effects are traced to one secondary cause, it is easy to say that this is the real and the ultimate one : or else it is easy to admit the Creator's will in the appointment of that cause, as an arbitrary act, whether for one or more ends, or for no ends at all, but such as contingency would produce. And accordingly, the Atheistical philosophy, as it is termed, has taken one of those views, while a certain theism has adopted the other. But if there be one effect, and only one, produced by a great variety of secondary causes,

if those causes are totally unconnected, independent, or dissimilar, if they also depend on no common previous one, if therefore they are the produce of no prior cause short of the Will of the Deity, or if we must refer to the First Cause as the only one uniting the whole, then may we safely and fairly infer, that each of these immediate causes was an act of His will, or an arbitrary law of His immediate appointment. The ultimate, or First Cause, will therefore be the only common one through which all the subordinate ones produce their effect, and must thus become the final object of reference.

Nor do I see any fallacy, or any philosophical deficiency in this reasoning : while they who may object to it, will probably perceive, on quiet reflection, that their objections are not philosophical ones, but the result of those habits of philosophy which consider a reference to the First Cause as doing nothing, or as a confession of ignorance ; or else, that they are the effect of those prejudices or systems, which do not choose to acknowledge the Deity as a cause ; to include His Will in the list of philosophical causes. When brought to this analysis, the conclusion is, assuredly, a strange one, except under a pure Atheism : since it is to reject out of the list of causes, that very cause which must be the most efficient, as being the most comprehensive of all ; the universal, the ultimate cause of everything.

And thus leaving the objections which I cannot discover, to those who are able to produce them, yet who must produce them on other grounds than those now named, the general argument which I mean to use, is summed in the following form. That it was the intention of the Deity to produce a certain effect, superadded to all the other effects intended by His contrivances, and that, for this purpose, He has simply

willed that this effect shall occur, in addition to all others : whence we may infer that arbitrary law, or command, as the only link which binds all the immediate or secondary causes, discordant in themselves as they are, into the production of this effect. And the effect in question is the feeling, or sense, of Beauty, through impressions on the organ of sight. I need only add, that the case is not altered by arguing that this arbitrary law is appointed to the mind, not to the objects, because the intended effect occurs in mind : since, in either view, the exciting causes are different, while the effect is one : thus implying a law as intricate in the one case as the other, while equally arbitrary in both.

I could not well here examine the opinions or theories of preceding philosophers on this subject; had I not previously made this broad and metaphysical statement. The remarks would have remained open to cavils, as easily made as they would have been tedious and inconvenient to answer. A general answer is provided in this consolidated view : and to this sketch, he who finds particular objections hereafter, can refer. In a future part of this chapter, it will be restated in a more detailed manner. I may therefore proceed : limiting myself, at present, to the pleasures derived from the sense of seeing ; constituting the difficult question of Beauty, so often discussed at great length, by philosophers beyond enumerating.

It would be a task unfitted for this place, to analyze, or even to state, the several hypotheses of the writers on this favoured and much-disputed subject. I must presume that the reader has at least a general acquaintance with those works, and also with the names of writers whom I could not well specify for criticism,

except under more detailed views of their several hypotheses. But one general objection applies to the whole : easily conjectured from the preceding statement.

Every writer has adopted some general principle, or principles, of his own, for the purpose of explaining why Beauty produces that particular sense of pleasure in the mind, for which we have no other term than the identical one, as in the case of heat, namely, that it is the sense or feeling of Beauty. But I must premise, that I limit the term to visible beauty : not merely because the present purpose demands it, but because, to use it in the far wider sense in which it has often been applied by those writers, is to confound things the most discordant, through a term, which, under those applications, is a metaphorical one, derived from that which is an object of the sense of sight : while this carelessness, or confusion of terms, has, if I mistake not, led to that confusion of ideas which has produced some of these very hypotheses.

There are writers, indeed, who deny that the application of the term Beauty to moral acts and sentiments is a metaphorical one: maintaining, on the contrary, that the reverse is the fact, that the term is truly applied in a moral sense, and is metaphorical in its physical application. This is an abuse arising from the poverty of language ; and the current sense of mankind is against it. But he who chooses to adopt the word Beauty in this manner, gives himself very useless trouble in detailing his moral hypothesis of visible beauty ; he has already begged the whole question. And he has often done this too, without perceiving it : leading us, as metaphysics for ever do, round and round, in a fruitless circle, to the point whence we com-

menced, through reasonings which become superfluous, as soon as the terms which are used have been defined.

But, having no space for discussions of this nature, I must proceed to notice the chief hypothesis on this subject : since that is indispensable, under my present attempt to point out what I consider the only theory. Were they not thus examined and answered, their habitual influence might render whatever I may state purposeless : especially under that weight of authority, not less than habit, which they possess ; since to the multitude, these are always the sufficient reasons. And a metaphysician, at least, will easily see, when it is pointed out, that one of these hypotheses has proceeded as if it were dealing with physical science alone, in its perpetual efforts after secondary causes, though not aware that it was thus acting : attempting to bring Mind, of which it knew nothing, under the action of definite and assumed laws; and forgetting the very essence of those metaphysics which it imagined itself to be discussing.

As my space and purpose condemn me to extreme brevity, on a subject which might well occupy a volume, as it has filled many volumes, I must attempt to classify these hypotheses, and also under a very brief view. I have as little room for their varieties as their details ; still less, for distinguishing them under their several authors. Nor is that required for my purpose. It is of the assigned causes of the feeling of Beauty that I am to inquire ; it suffices if I can classify them in any manner. And I think that they can be divided in such a way as to show that there are but two essentially distinct hypotheses, while there is an intermediate one which is a mixture of both. I would

willingly have avoided naming any authors, but I cannot : it is indispensable, for the sake of reference to the hypotheses themselves ; and fortunately, two names will suffice for the three ; while, out of many, I shall choose the most popular, and therefore the most convenient, in Burke and Alison. Reluctantly, even thus far : since, disagreeable as controversy always is, it seems to me especially odious in a work of this nature, where far different feelings ought to be universal : if that has been forgotten by a recent writer on this subject, and the most acrid of controversialists.

The first hypothesis, as thus classified, seeks to find the causes of beauty in certain physical circumstances, of form and colour, but chiefly of form : and the second is the moral one to which I have just alluded, which refers every feeling of beauty to moral associations. If the name of Burke is the most convenient reference for the first, though far from the only one, the same name must also serve for that third, or intermediate hypothesis, which partakes of both. His hypothesis, therefore, is especially vague : while he does not even seem to have perceived that it was so. It is without plan, as it is deficient in philosophy : a collection of distinct efforts at explanation, and, often repeating little better than identical propositions ; in language too, of which the obscurity does not always arise from the p. etensions to an aphoristic brevity. I regret that I cannot think otherwise of a highly lauded book : while those praises may serve to show how little the multitude has been accustomed to think on this subject.

I may commence with the first of these hypotheses : but they who desire to know it, under all its modes, must consult many writers, whom I do not name, for

the reasons assigned : not forgetting those who have treated, separately, of what they have been pleased to call the picturesque. Thence, the little that I have noticed for illustration, is taken from more than one theorist. The essential principles, however, are the same, and the same answers will serve for all : as they may be extended, by any one, to the facts which I shall not notice.

All visible beauty, it is plain, must consist in form and colour chiefly ; since even motion is nearly reducible to form : so that the basis of examination is simple. And under each, the writers in question have attempted to classify these sources beneath certain general heads, which thus became their principles of Beauty. If Burke has referred, to some fanciful curve, among other physical causes, that beauty, which, seldom seeing into his own mind, he ought chiefly to have sought in moral associations, and if Hogarth has laboured to point out some incomprehensible curve as the line of beauty, writers, desiring to be more exact, have sought the basis of all the beauty of form, in the Ellipse. To say that beauty depends on the elliptic curve, is to use a term of no meaning in this case. True, it is a single curve, to a mathematician ; because, under all of its endless forms, it possesses certain steady mathematical properties : but, to the eye, it presents a thousand different curves, varying, from what does not visibly differ from a straight line, to a perfect circle. If under all these forms it is beautiful, that beauty, assuredly, does not arise from the community of its mathematical properties. But the prime forgetfulness in this case, is to have forgotten to ask, why the ellipse, or any other curve, produced the feeling of Beauty. The essential question remains just where it did before :

and it will immediately be seen, that the same oversight pervades every part of the hypothesis. That painters should have made this prime mistake, is not surprising: but that those who fancied themselves treating a metaphysical subject metaphysically, should not have discovered that they were only substituting one word for another, ought to astonish us.

I know not that it is worth while to examine the other modes of physical form to which the source or cause of Beauty has been referred, under the same hypothesis: since the same general reasonings, and the same answers, apply to all. It has been sought in smoothness, and in gentle variations: it has been referred to asperity and sudden changes, or to "roughness:" and thus have contests sprung up between an hypothesis of the beautiful and an hypothesis of the picturesque, as if these were aught but two words to express beauty, if beauty of different kinds. And these have not been mere logomachies: as all who have studied this subject know. If smoothness, or polish, of surface, has been referred to form as a source of beauty, this is but an example of the numerous cases where an intermediate hypothesis has been adopted without perceiving it: since these are cases of association, referring to another source of pleasure. As far as this hypothesis has concerned itself with colour, I need not now make any remarks; since I must enlarge on this subject hereafter: while the general answer is still the same for both.

The practical answer to any theory of curves, or definite forms of any nature, as the source of Beauty, is derived from a mere glance at Creation; and it is overwhelming. Among thousands of animals, there is scarcely one which does not convey the impression of

beauty of form, in some mode or other ; except where peculiar associations, derived from disagreeable qualities, or from prejudices, interfere. And those forms are varied in an endless manner, under an utter refusal of conformity to any curve, or line, or combination of lines, or any general principle, of whatever nature. But this is much more striking in the vegetable kingdom. It is sufficient to cast an eye over the familiar plants, to feel that they all produce the impression of Beauty, if in different degrees, with scarcely perhaps an exception ; and under that pure reference to their forms alone, which all can make if they choose : while, if we should attempt any analysis or classification, it is not the work of an instant to be assured, that there is no one assumed principle, nor even more than one, which we can extend, without an immediate check, compelling us to renounce it. Or, if any one doubt this, let him enter a greenhouse containing an extensive collection of different plants, and he will abandon such a theory without a moment's hesitation. This case is also a more satisfactory one than the former, in practice ; because there are few or no unpleasant associations, to prevent the full force and impression of Beauty. If ever offensive, they have no voluntary powers of offence : while, possessed of no moral qualities, they cannot excite those associations as to moral evil, which are so readily produced by animals. If, as is unquestioned, there are numerous associations tending to enhance the beauty of plants, there is as little difficulty in separating these, by due attention, as in being convinced that they operate directly on our minds, by their mere forms, and even independently of colour : while, on this, the theory of moral associations, I shall have occasion to speak directly.

I might enlarge this practical answer, almost without bounds : but it is neither needful nor convenient. There is a philosophical answer, of even more importance : while it will excite not less surprise at the logical deficiencies of all the abettors of these hypotheses. Were there more logic, there would be fewer hypotheses, in everything : but the oversight, here, is especially surpassing. Every hypothesis of this nature is not a theory, but a classification. If any one writer had even done this well, he would have effected but a good and true generalization : whereas they have, all, made imperfect or erroneous ones. The sources of Beauty might have been classified, if they have not, under leading physical heads, of wide application. But though they had, though the whole could have been brought under even one, or two, leading heads, this would not have been a Theory of beauty. It would, still, have been but a grouping of its sources. The final and essential question ever remains : why do those forms excite the pleasing sensation which is the feeling of Beauty ?

Any further answer, on metaphysical considerations, is involved in the future answers to other hypotheses : and I may therefore proceed to what I have termed the intermediate hypothesis. If the associations adopted in this case as the source of the feeling of Beauty, are not always those on which the other leading hypothesis has been founded, if not always associations of sentiment (to use this term), they cannot be effectually distinguished, and need not : they are still moral ones, and I need not care for order, in stating this hypothesis.

The source of Beauty has been sought in utility, added to intrinsic form ; as it has also been referred to

utility alone : and the reasons have been thus stated. The uses of certain objects being sources of pleasure, we receive pleasure, the pleasure of Beauty, from the simple sight of the forms themselves, by association. This is easily answered. There are thousands of cases to which it cannot be applied, under any violence of construction. I need not name what the slightest attention can find. There are innumerable beautiful objects for which no possible use can be imagined, even under any, the most remote and fanciful association : there are many, of great and constant utility, in which no one can fancy beauty, by any stretch of imagination ; as there are many useful objects that are essentially distasteful, in form and colour both, and as there are also beautiful and distasteful forms in many things which possess a single utility. And though such association should aid, in any specific instance, it is but what happens in many other cases, while it does not prove the association to be the source of the beauty : as it also leaves the essential difficulty as unanswered as ever. Nothing can well show the feebleness of an hypothesis much more, than to find it driven to such resources : as the blindness which can thus satisfy itself, is not less extraordinary.

And, after all, this is no hypothesis : it is but one among an ill-united collection of imaginary reasons why the sensation of Beauty is felt. Like all that follows, of the same kind, it is even discreditable to a fabricator of hypotheses, under his own empty pursuit. It is to be ever shifting the ground, because the hypothesis would not explain the cases. It might have been well, had those writers done no more : since all who will examine them, can see where they have suppressed cases which none of their contrivances would

explain, and also denied the fact of Beauty in others, not so much from insensibility to it, as from the necessity of maintaining the hypothesis, on any terms. All who have concerned themselves on this subject, will easily refer to the examples.

Similarly have we been desired to believe, and by those who have adopted the hypothesis of definite physical form at the same time, that certain forms produce the feeling of Beauty, because they prove design or skill ; this being the real subject of admiration. And, enhancing on this, a metaphysician of some repute has included power, wisdom, and intelligence, and even goodness, as the true sources or causes of the feeling of Beauty, even while rejecting the theory of moral associations which I shall immediately notice : thus considering the exciting objects as merely the demonstration of those qualities in the Creator.

One answer at least to this very far-fetched hypothesis is abundantly obvious. It refers our sense of Beauty, that of all mankind, that of children, to an abstruse process of reasoning, under a high exertion of the intellectual faculties, and a mass of information, which are not found in one among thousands, or millions, who are sensible to Beauty : to say nothing of a philosophical piety, not very abounding, even among philosophers. It would be unjust to suppose that the metaphysician who has thus argued, in speaking of the sublimity and beauty of the universe, was desirous of the reputation of thinking as he did not feel : but with the feelings which he professed, respecting the Divine goodness, he might have found the much shorter argument which I have here adopted, as he could also have applied it to all mankind : thus extending the goodness of the Deity, instead of confining it, so as almost to

defeat its very existence, in the insufficiency of its application. But the facts are a sufficient answer to this and all similar hypotheses. The appeal is to the universal sense of mankind : to that which philosophers for ever affect to despise, because it opposes that tyranny of vanity, through which they dictate, that they may exalt themselves ; which is, nevertheless, the appeal that cannot be appealed from in such cases, and will not be appealed from, by those who know what philosophers have been and what philosophy has said.

There is another refinement under which the semi-metaphysicians of this intermediate hypothesis have sought a cause of the feeling of Beauty: uniting a moral inference, or association, to one of their generalizations of physical forms: a generalization without principles, derived from the habits of physical science, and utterly disregarding mind, while it fancied itself reasoning on metaphysical principles.

This has been termed the Beauty arising from order, regularity, symmetry, uniformity, and so forth : while, to these, I may add proportion, as they have done, since I need not make two discussions out of one hypothesis. In the view of those who thus seek abstruse associations, as the joint source, at least, of the feeling of Beauty, these qualities produce the effect in question, by suggesting design and intelligence in the first place, and, next, by aiding our comprehension and memory as to the objects themselves. The answer to the first part of this proposition has just been given : it is the same hypothesis in a more circuitous, and therefore, a worse form. The last part is scarcely to be answered, because it is not intelligible. This metaphysician, at least, would be little grateful for the answer which might easily be given by a very slender reasoner.

But this ought to be enough as to all these varieties, and more, of an intermediate hypothesis; or of any one, deriving Beauty from moral associations, or circuitous moral reasonings, distinct from that which constitutes the only other hypothesis remaining for examination. Nor are the general answers to the whole remote. If regularity, or symmetry, or repetition of equality in parts and objects, or aught else of a similar nature, be the assumed causes of Beauty, the difficulty, under the most favourable view, is only removed by a generalization, as before: and, as far as all these are but partial, or joint causes, they are but facts under a classification, which is nothing, because the several parts have no dependence. There are twenty or fifty causes of Beauty: which is exactly what we knew before: but why any of these causes, be they ten, or ten thousand, excite the feeling of Beauty, is that which we do not know, and which these hypotheses do not explain. Why are those reduced, or consolidated, classes of beauty, beautiful? A child can ask the question, and the philosopher forgets that he has not given the answer.

But the metaphysicians who have invented these hypotheses are even more unpardonable: since they have used identical terms only, when they have fancied themselves making discoveries in substituting one word for another. Symmetry is Beauty: proportion is Beauty: they are the thing itself, not its causes: and why they are so, we are therefore equally ignorant: the answer is as identical as the proposition. And I need scarcely repeat the broader and more easy answer to all this. Admitting every hypothesis, and every branch of every hypothesis, to be valid, there are still innumerable

cases of Beauty to which they cannot be applied. It becomes necessary therefore to invent more of these classifications: but this soon ends, if not in the abandonment of the hypothesis, in a tacit confession of its weakness at least, which any person accustomed to accurate thinking may detect. If classifications are of any use, let them be perfected: but we must not suffer ourselves to be deceived into the belief that they are Theories of Beauty.

I need not protract the inquiry on this class of hypotheses. I trust that I have furnished a general clue by which they can all be analyzed and answered, under whatever form proposed: while if any should appear intricate, or not immediately amenable to this kind of reasoning, a little reflection on the nature of the analysis here exemplified, will leave no difficulty. I proceed to the other leading hypothesis.

It was an ancient and a general opinion, that moral sublimity and beauty were thus termed, through a species of metaphor derived from natural and visible beauty: and, on this, I may refer to Cicero, while I need not extend the reference. The theory in question has reversed this view; by deducing all our feelings of visible beauty, from certain reasonings or comparisons of a moral nature, if not perceptible by us; or, from associations, seldom examined, or even thought of, with what must be called moral beauty. Or, to state this in the more usual, and in a fuller manner, it is said that all our notions of moral qualities are connected with material signs or appearances: and thus it is inferred, that when we feel the beauty of the natural sign, it is because we refer to our conviction or approbation of the moral beauty with which it is connected.

This hypothesis has, at least, the comparative merit of simplicity and unity: and it has been illustrated at considerable length, by a selection of examples.

But a very little attention will discover, that the examples have been culled in support of the hypothesis, that what was not to be explained by it has been suppressed, and also that where it was impossible to bring the cases within its powers of explanation, the existence of Beauty has been absolutely denied. But all hypotheses are equally disingenuous: it is no peculiar blame to this one. It is, moreover, still further evident, that in the cases which have been most triumphantly quoted in proof, those effects derived from moral associations which nobody denies, have been brought forward into the most conspicuous light, while all that belongs to the primary impressions of visible beauty has been kept back. In the case of man, in particular, the association is so close, that it may be difficult to dissever the physical impression and the moral effect: but when it is argued that the latter is the only foundation of the sense of human beauty, it is to oppose the universal experience of mankind: as all can see, who will take the trouble to reflect on what could not be very fittingly examined in this place.

The hypothesis is not, however, so simple as it appears at first sight: and a fuller explanation of its nature will perhaps form one of the best answers to it. In the first place, the qualities of mind, it is said, are known by certain visible properties in the animal, in man, and these properties are, therefore, felt to be beautiful; while, in the next, we feel the beauties of inanimate nature, only because certain of its qualities remind us of those which, in the human structure, indicate approvable qualities in the mind, a moral beauty.

The tortuous reasoning and painful effort required to draw such conclusions, ought to be a sufficient answer: even if a thousand facts of hourly occurrence could not be brought against this speculation, by the most ignorant and unobserving of mankind. Does even the philosopher in his cabinet persuade himself that it is thus he feels the beauties of nature? He must do much more before he will persuade mankind that they possess associations which they cannot discover, and are reasoning about a moral beauty, of the existence of which they never dreamed. And when it is said that the strength of an oak or the modesty of a violet are exciting causes of the sense of Beauty because of their reference to similar qualities of mind, what is this but to forget that these are metaphorical expressions, derived from the latter, and applied to the physical objects, and resulting sometimes from the poverty of language, at others from the ingenuity of poets. The poet indeed does enhance the beauty by such comparisons: but of all those thousands who admire a violet, how many ever heard or thought of its modesty, or ever, perhaps, thought of such a quality as modesty? All such associations, be they sought where they may, are accessory or additional sources of pleasure, but they are limited to specific cases, and are also confined to a few individuals among thousands or millions: the very philosopher who writes of them, has often been at no small trouble to make them out.

But the reader may perhaps expect a more specific answer, under a detail of facts. I will therefore take the case of colour, and its beauty, for this purpose; because it is the most simple, and admits of illustration by a reference to the feelings of every one, however ignorant, or however little he may have thought on

this subject. It is also one that I must examine hereafter, in reference to a true theory, so that the present remarks will serve two purposes.

It is sufficient to examine the instances quoted by the hypothesis in proof that the beauty of all colours depends on moral associations, to be immediately convinced, that whatever accessory or additional sources of pleasure these may be, there is a prime sense of gratification, independent of them all. On this, we can appeal, as usual, to the common feelings of mankind ; to those who never reasoned, and have no such associations as are imagined. Metaphysicians assert much : but they will not, at least, say, that children are under the influence of moral reasonings or associations, of which they are unconscious. I think I might even appeal to the animal world, as to the initial and independent sense of pleasure, or Beauty, felt from colour. If it is a bond of union, as well as of recognition among species, it would be very extraordinary if the beauty that leads to attachment, were not a source of pleasure, as it is in ourselves : while the usual views of metaphysicians respecting the animal mind, will voluntarily admit that it is instinctive. And if thus, why not equally an instinct in ourselves ? as I trust to show. The Peacock, and others, of marked and splendid plumage, have been taught to display it that they may please or attract their mates. This implies that pleasure is felt ; and what else does the Pigeon feel, when it expresses its delight before a mirror ? The very dislike to scarlet, in some animals, proves the same, if in a less direct manner : since a painful impression from this source, implies that there are also pleasurable ones.

If, again, we take the rainbow, or the prismatic spec-

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trum, it is an answer to the hypothesis, as full as it is simple. This is beauty which all feel, instantly, and without reference to aught else. All feel the beauty of the clouds which attend the setting sun : but the associations are not necessarily agreeable. The seaman may foresee the hurricane: he is sure of toil and danger, he may think of death. There may be a fearful, a horrible beauty: but the beauty is there, and it is felt; in spite of all associations. The songs of the early birds, the freshness of the air, the glittering dew-drops, all enhance the beauty of the morning sun; the mind itself is more alive to pleasure; all is favourable: yet the evening sky is the more beautiful object, and its beauty consists in its physical superiority. The prime impression and sense of Beauty is more powerful than the casual associations. To say that the beauty of colour in the human countenance arises from circuitous references to health and youth, or to imagined moral qualities, is equally to theorize in defiance of facts; since we can receive, or possess, the fullest conviction of all these, and even from colour, where nevertheless, from defective arrangement, in tone, gradation, quantity, or contrast, the colouring is disagreeable, or painful. Nor does the colouring cease to be beautiful, though we know it is the presage of death; or though we have ample knowledge of the detestable moral qualities of the individual. It is no novelty, that men daily sacrifice themselves to mere beauty, under the most perfect experience of the depravity of the possessor. Nothing of this kind could happen, were the hypothesis true.

These answers ought to suffice; as it would be easy to extend them. But I must also note the denial of the hypothesis, respecting the production of Beauty by certain less obvious circumstances relating to colour.

It may be, that it was because they could not be explained by it: in one writer at least, the cause seems to have been a total insensibility to this class of beauty. It is the exemplification of a very vulgar proverb: and more than one of the abettors of this hypothesis has equally exemplified it in the case of music, similarly explained. The painter forms a very different judgment: and the appeal is safely made to him, as to a cultivated mind, or to taste, since the hypothesis itself makes its own use of this sensibility.

To say that there is not an essential difference between warm and cold tints, is not only to be utterly ignorant of art, but to be absolutely without feeling to the beauty of colour. It is not less so, to say, that there are not certain proportions and contrasts between these two, which give especial pleasure to the eye, and without any reference to form. The same principle which guided the pencil of Van Huysum governed that of Rubens: and though the subjects and the forms are so widely different, the source of pleasure from colour is, in both, precisely the same. Painters indeed would have laboured in vain, had it not been so: as art would lose much of its power, but for this source of Beauty. Not to know it, is to be ignorant of that which has distinguished the characters of so many great schools of painting: it is to level Titian with West or David, to place in the same school Caravaggio and Vandycck, Michael Angelo and Murillo, Poussin and Tiepolo, Correggio and Spagnoletto.

But a painted Gothic window and a Turkey carpet are answers: for the same principles are applied, and with the same consequences. The answer is indeed overwhelming, when we find that Nature has even provided for some of these effects, by the mutual contrasts

of the spectral colours, and by their power in producing, as well as enhancing each other, through a provision in the nerve of the eye. This is intention : it is a regular design to produce the impression of Beauty by a special contrivance : as I shall hereafter show more fully. The eye feels, instantly, pleasurable impressions from certain approximations of colour, and disagreeable ones from others : it feels pain from unrelieved masses of cold colours, though the separate tints may be agreeable. And we can explain neither : it is a prime feeling ; an appointment of the Creator, or a law of our nature.

It is the same with degraded colours : the pleasures resulting from which are also denied, because the associations are considered neutral or disagreeable : though when the hypothesis finds that such colours are thought beautiful, it refers to the fashions of dress, or other associations which I need not name. The grey colouring of a Dove is thence said to be agreeable ; because that bird is a dove. But that is not the reason ; since the Kittiwake is not an amiable animal ; yet its colouring is not less beautiful. But the best answer is a picture of Teniers. Every thing else may be disagreeable, and is often odious : above all, such are the moral associations with the characters depicted. Yet who does not feel the beauty of those paintings ; and that beauty consisting, almost exclusively, in a peculiar distribution of degraded colours ? If the metaphysician who thus writes cannot feel, it is his misfortune. His own standard of taste he may still enjoy : but he must enjoy it alone. And the appeal needs not be to a painter : to a conventional or a cultivated taste. All are sensible to this source of Beauty, widely, in the animal creation. The beauty of the colouring of the landscape is, often,

little other. Excepting the blue sky, and little more, all the tones are low : if pure green is a beautiful colour, to any one, it scarcely occurs in the landscape : and when it does, it is not beautiful. The very term, harmony of colouring, should be an answer to the hypothesis. This is neither a fiction nor a conventional beauty; it is felt, at once, by all who can feel anything, and its causes are found in what I have already stated.

Need I appeal further, to the universal feeling respecting the beauty of flowers? Peculiar associations, aiding beauty, may be granted: but there is beauty independent of them. It is indeed easy to find a Rose, and the flower of a Holyoak, little differing in aspect; as the latter also, both in form and colour, is often the most beautiful. But we turn from the one with indifference, while we almost worship the other. This is an example of association: it is with odour, with the special loveliness of June, with poetry: there is a charm in the very name. But if a thousand different kinds of colour, as of form, produce as many distinct feelings of beauty, the hypothesis must be provided with a distinct association for each; or it is worthless. What are the possible associations? Purity, modesty, innocence, youth, female beauty: add what more it can, the list is soon exhausted; but the variety of beauty in flowers is inexhaustible. In children, almost in infants, the love of flowers is a passion; what does the hypothesis answer? But I may terminate the answers thus derived from facts; as any one can extend them: as I need not, and, here, ought not. But let no one imagine that they have been adduced for the sake of controversy: it was indispensable to demolish all these false structures, before attempting to raise a better.

The metaphysics of this hypothesis must have already appeared sufficiently obscure : nor is the logic especially remarkable for accuracy. It seems scarcely aware that it has adopted a secondary set of causes, like the other one, if of a different nature, and that it has not explained how those act in exciting the feeling of Beauty. It is moral beauty, under various modes, which excites the sense of pleasure termed the feeling of Beauty, primarily : the visible object is but a subordinate or remote cause. It is needful then to explain why certain moral considerations excite those feelings of pleasure ; or the Theory of beauty is little other than it was before. The needful step to a solution is, to admit the existence of what has been called the Moral sense, so much disputed : though it will still remain to be asked, what the moral sense is, in infants and in animals. But this also is assuming to know the whole constitution of mind : which will scarcely be granted to those, nor to better metaphysicians. That they have not perceived these inferences, seems sufficiently plain.

But though the Moral sense were adopted as the solution, what follows ? It consists of an instinct or instincts : an implanted approbation of certain moral relations, following necessarily on the perception of those. And if this is the law of the mind, why must it include the entire constitution of that unintelligible entity ? It does not : there are many more primary feelings, or instincts : and why then may not a direct and primary instinct of Beauty, an ordained source of pleasure arising from the sight of objects, be among those instincts ? He would be a bold metaphysician who should say, This is not, and cannot be. No impartial person can see this imagined necessity of excluding an

initial and independent feeling of Beauty : while this hypothesis takes an indirect road, when the direct one is before it ; even then, leaving the essential difficulty what it was. The influence of associations, nobody will deny : they form a powerful accessory source of pleasure : but the hypothesis has confounded an original and instinctive sentiment, with an operation of the intellect ; while not a little misleading itself, by a loose or double application of the single term, Beauty.

If the view of the cause of the feeling of Beauty which is here proposed, has been already indicated in the commencement of this chapter, it requires some development. It appears to me, that the Creator has intended, through the sense of sight, to superadd pure and superfluous pleasure to mere utility : while this inference is borne out by a great train of analogies extending all through creation, and, very strikingly, by the facts relating to the sense of smell, which were detailed in the last chapter. That He has, for this end, appointed an instinctive feeling of Beauty, or commanded that certain forms and colours shall produce pleasure, simply and directly : while, of the actual causes of this pleasure, as of the condition of mind which it implies, we are entirely ignorant ; yet not more ignorant than we are of the cause of other pleasurable feelings, through the other senses, or through the moral sentiments, or through the exertion of the intellectual faculties ; so that this offers no peculiar difficulty. This feeling of Beauty is therefore a portion of the original constitution of Mind ; having no reference to any other of its qualities or operations : and it is also excited by a multitude of causes, exceedingly numerous in properties, and as distinct ; admitting of but very limited classification, and agreeing in no one

common property but this, that they excite the feeling of Beauty ; yet under varieties connected with their peculiar properties. If a moral sense be admitted, it is, like that, an independent and original property, or instinct, of mind. And further, if the Creator has, by an act of His will, conferred on Mind, this mysterious property or power, so has He, not only provided, in bodies, in visible existences, an infinite variety of different qualities, of form and colour, independent of all imaginable utility, that He might produce an equivalent variety of pleasurable effect, or multiply the modes, as well as the sources of pleasure ; but has even rendered all the objects of Creation beautiful, in some manner, for this beneficent end.

I originally called this an arbitrary law : an appointment, under the Creator's will, for the production of a designed and specific purpose ; the end being a benevolent one. It is always agreeable to us to know the means by which He acts ; as it is our duty, and our pleasure equally, to investigate them. But this is one of the cases which seem to afford no hope : the solution depends on that which as far as we can discern, our faculties have not been made capable of comprehending. It is not therefore a Theory of Beauty ; if it is to be the definition of a Theory, that it must explain every cause, in succession, up to the First cause itself. But if there is any theory in philosophy which is compelled to stop short of the First cause, it stands on no worse grounds. The interval is shorter : that is all. There is no theory essentially more perfect : though many may be more operose, from the nature of the secondary causes with which they are concerned. In the present case, we must resort immediately to the First cause : but this we are compelled to do in almost

all that relates to the constitution of Mind. Metaphysics have indeed laboured to find secondary ones ; but every person knows with what success. Therefore must I consider the direct will of the Creator to produce a specific effect on Mind, as the only Theory of Beauty that can be furnished, though the usual habits of a busily useless philosophy will prevent that from considering it as a Theory. In the mean time, there is nothing to prevent the objects or sources of Beauty from being classified, as they have partially been : though the classifiers must not forget, that such generalizations do not constitute a Theory of Beauty, as the abettors of a moral hypothesis must also remember the difference between the accessory and the essential.

I have not much of physical analogy or argument to adduce in support of that which rests on à priori and metaphysical grounds, beyond what I already suggested in the singular and operose provisions for the pleasures of smell. Yet this perhaps is not unworthy of notice. If we find a peculiar and unexpected contrivance in Creation, purely arbitrary, serving no purpose but one, widely applied, and to the production of a single definite effect, we are entitled to view it as a " law," designed for that specific end ; and we may therefore argue that the end was intended to be produced by it. The case of spectral opposition in colours, just noticed, is this very law ; there is no reason why it should produce its known consequences, in exciting the sense of beauty ; and it produces those through an equally arbitrary, related, provision, in the nerve of sight, or in the mind. And it is largely applied, as I shall show hereafter. May we not argue up to the intention to produce the sense of Beauty, by a direct and equally arbitrary action, through a peculiar contrivance ?

If there are many more facts relating to colours, which can be adduced to strengthen this inference, I must refer the reader to a future part of this chapter : they constitute a necessary portion of those remarks on the beauty of Creation, to which I shall now proceed : regretting only, that on a subject so wide and so pleasing, I am condemned to a painful brevity.

We cannot look around us, without being struck by the surprising variety and multiplicity of the sources of Beauty in Creation ; produced by form, or by colour, or by both united. It is scarcely too much to say, that every object in nature, animated and inanimate, is, in some manner, beautiful : so largely has the Creator provided for our pleasures through the sense of sight. It is rare to see anything that does not possess some beauty : far more so, to find anything which is, in itself, distasteful, or disagreeable to the eye, or repulsive : while on this, however, they alone are entitled to pronounce, who have cultivated the faculty in question ; since, like every other quality of mind as of body, it is left to ourselves to improve that, of which the basis has been given to us, as the means of cultivating it have been placed in our power. May I not also say, that this Beauty has been conferred, in Wisdom, as in Beneficence ? It is one of the revelations which the Creator has made of Himself to man. He was to be admired and loved : it was through the demonstrations of His character that we could alone see Him and judge of Him : and in thus inducing or compelling us to admire and love the visible works of His hand, He has taught us to love and adore Himself. This is the great lesson which the beauty of Creation teaches, in addition to the pleasure which it affords : but, for this, we must cultivate that simple, and surely amiable piety, which

learns to view the Father of the Universe in all the works of that universe. Such is the lesson taught by that certainly reasonable philosophy which desires to unite what men have too much laboured to dissever ; a state of mind which is easily attainable, demands no effort of feeling beyond that of a simple and good heart, and needs not diverge into a weak and censurable enthusiasm. Much therefore is he to be pitied, or condemned, who has not cultivated this faculty in this manner ; who is not for ever looking round on Creation, in feeling and in search of those beauties ; that he may thus bend in gratitude and love, before the Author of all Beauty.

Creation is everywhere beautiful ; I repeat what I have said : and if there are cases where it appears otherwise, it is chiefly through associations of a moral nature. It is difficult to point out anything which is simply and intrinsically distasteful, or which, should it appear so in one view, some accident, of colour and combination, will not render agreeable. If a superficial examination judges otherwise, it will generally be found that such objects are merely less beautiful than others ; as much may also arise from peculiar prejudices ; while the proof of this is, that many will perceive beauty where others see only objects of dislike. It would have been a much juster theory that had attempted to explain the want of beauty, rather than its existence, through moral associations. They are the frequent reasons why objects which are intrinsically beautiful, appear otherwise to us : as might easily be illustrated, could aught so obvious be needed.

There is not a plant in the universe which is not beautiful in some manner : and the varieties of beauty in these are endless. If there is an unpleasing object

in this wide Creation, I know not where to seek it. The multiplicity of forms, the most different, the most discordant, the most contrasted, is immense, uncountable ; yet from the most humble or singular lichen or fungus, to the most graceful plant, the most brilliant flower, or the most elegant tree, there is Beauty everywhere. It is a Creation of beauty. On the land, or beneath the waters, open to every one, or concealed from all but research and industry, everything is beautiful, and the varieties of this beauty pass all enumeration : disdaining all theories, and confounding those who seek in aught but the Will of the Creator, for that which He commanded because He thought fit so to do, for us and for our enjoyment.

In the animal world it is the same : though it is here that the moral associations prevail, so as to produce an apparent check to the same universal conclusion. Yet the painter and the naturalist are here the true judges ; and to their decisions we ought to conform. The one feels beauty, because he knows it through the cultivation of that faculty which all have received, and so many neglect ; the other, because he has divested himself of the disagreeable associations : and it is false to say, as is said, that he has invented a conventional beauty for himself, and is a self-deceiver. The reverse is true : he has cultivated his taste by the contemplation of the sources of beauty which Nature has provided for all ; and there is nothing to pervert his judgment or interfere with his feelings.

No man creates beauty by a wish : insanity indeed may see what is not, but even enthusiasm only exalts that which it finds. Nature has been created beautiful, and we teach ourselves to discover its beauties. The provision has been made by a bountiful Creator, on

both parts ; in the objects and in the sense : but while the objects are ever the same, the sense must be cultivated, that it may feel their powers. And the pleasure is the reward of the labour : it is but one example of the universal rule. The foundation of Taste is given ; but Taste must be cultivated : it is a branch of an analogy which pervades everything. If it has been originally allotted in unequal degrees, this is but what has been done in the case of all the faculties of the mind : yet, in all, it is to be improved by exertion, and thus only is Taste the result of cultivation ; of labour.

Hence may we perhaps acquire a clearer insight into the real nature of that eternally disputed question, the standard of Taste : the source of as much vague writing, and unintelligible contest, as anything in which metaphysicians have engaged. That standard can consist in nothing but perfection : in an accurate, entire, and universal sense of all Beauty, in all its sources : in a warm feeling of all those beauties, since warmth of feeling is perfection in all that relates to feeling, and in perfect discrimination, since profound knowledge implies equally nice powers of comparison. But whatever person we assume as the Standard, or in what way soever we fix or limit it, as has been attempted, it is no longer such, when another man has been found who feels beauty more widely and warmly, when there is beauty felt, by any one, in things which this assumed standard had not noticed or included. Thus also may one man be the temporary standard, or he might even be the absolute one, for one branch of beauty ; while, in some other branch, we must seek the standard elsewhere. It is a strange oversight, to have used the terms Standard of Taste, and Taste, as if the latter was a peculiar and single quality, embracing all the

sources of beauty, and capable of deciding on all. The standard of taste as to the human form, might fairly be sought in Phidias or Raphael: but the same standard as to butterflies and tulips, must be sought in the entomologist and the florist. And thus of all else ; of that which is termed beauty ; but which is not visible beauty. The perfect taste in poetry is not always the perfect in prose composition : and nothing but that loose application of the term Beauty which I formerly noticed, could have confounded all the kinds of beauty, the metaphorical as well as the original, under the sweeping term Taste, as the quality by which they were all, equally, to be judged. Whether the one inaccuracy has led to the other, or not, I need not here inquire : but each is an example of that confusion, the source of interminable contest, and equally interminable writing, which is produced by the lax use of words : by using words without definite ideas.

The real and final standard of taste, or the ultimate possible appeal in every case, would be to a mind of absolute perfection. Conceiving, as men have done, of angels, we can imagine an angel to be, or to possess, the standard of Taste ; or to feel, thoroughly and perfectly, every beauty that exists. But, if I may thus speak, it is in the Deity alone that we can truly seek the standard of taste. Metaphysical reasoning assures us that He is perfect, and the only perfect : and it is in His knowledge, and judgment of Beauty, where we cannot seek it, that this standard should be sought. Yet the following conclusion we can perhaps derive from a consideration of this nature ; and if it be just, as it is metaphysically justified, it will confirm what I have already said respecting the universal beauty of creation. We cannot believe that He created any thing which

was not beautiful, or which was the reverse of beautiful ; and we have also been told that He did approve of His own works. Therefore all creation ought to display beauty : but thence also the important practical conclusion, confirming, in another manner, what I have just said, that he who sees and feels those beauties in the greatest number and perfection, will approach nearest to the standard of Taste. He will possess the most, or the greatest, or the best, Taste : a conclusion considerably different from that which seeks the proof of taste in fastidiousness and censure and discontent.

Yet this practical fact remains ; but without affecting the former conclusion : while it seems extraordinary that it should have been overlooked by those who have written so much on this tormented and ill-discussed subject. Whatever a man may concede, through modesty or reasoning, he cannot but *feel* that he himself is the standard of taste : ignorance and vanity make no scruple in asserting it, and in terms which I shall not quote ; common, and also vulgar as the usual sayings are. It can be no otherwise : because he cannot measure his own sensations by another man's mind. Hence the true cause of the proverbial folly of disputing respecting tastes : the reference might be made to another person and taste, on the present grounds : but ignorance and vanity united, will not allow of such appeals. The sound reasoner however, he who knows in what taste really consists, as I have thus defined it, will be ready to yield to superior knowledge and discrimination, to a wider and warmer sense of beauty in another. He will perceive that he cannot be this standard, that he is not an adequate judge, when he finds a mind of acuter faculties and higher cultivation ; for the proof of those consists in a finer and fuller sense of Beauty.

He may not indeed feel this ; but he will know or believe it to be true, and his reason will submit. Nor can he forget, if he has made any progress in taste, or the discrimination of beauty, that he has adopted different standards during that progress ; that he has felt, successively, every prior one to be erroneous. He might have begun with Dow or Teniers ; he has proceeded to Titian or Rubens ; but he may yet be far from the further step to Raphael and Michael Angelo. Yet, if he is more wise than vain, he will believe that he is not yet right ; because he will believe in the truth of what others feel respecting these higher beauties, as he will labour to attain the same eminence by the cultivation of his own faculties.

It is also universally true, that as minds differ in their qualities, so are there some, which, independently at least of an obvious or laborious cultivation, are more alive to the feeling of beauty than others. In the arts, this is, or becomes, what is termed genius : under the present question, it is what is termed a natural taste. But that natural taste is no more a standard than is the taste acquired by cultivation. To assume that it is such, and also to assume, what is never true, that it is independent of all cultivation, is to suppose a perfect mind, perfect at least in this quality, out of the hands of nature.

The endless uses and abuses of this term would lead to a far longer inquiry, were this the place for what I can only notice with reference to my own subject, and which I could not avoid noticing. I have already remarked, that there may exist the feeling of beauty towards one class of objects, or department of nature, and not another. That is, perhaps always, the effect of peculiar cultivation. A particular species of beauty is discovered by studying the objects in which it occurs.

Such a person is the conchologist. But to deny that the beauties exist, is for the worshipper of Teniers to deny the beauty of Correggio. And all may acquire the sense of those peculiar classes of beauty, in the same manner : a taste for shells or tulips is to be formed, like a taste for pictures. Of conventional tastes, I need scarcely speak : it is, as before, a perfect knowledge of conventional beauty, perhaps indeed, often real, when little suspected, with a lively feeling of its effects. It is but the question of Beauty, under another form, and I need not examine it.

These remarks may be practically useful, independently of their bearings on this disputed point. They will teach us to yield to him who perceives beauty that we do not : for this is the real test of his superiority. They will also teach us to cultivate the love of beauty, since this is to cultivate the faculty, and thus to increase our pleasures: while piety may add, that this is to accept, and to be thankful for, the bounties of Him who cannot be pleased to find His gifts despised.

I cannot venture to pursue this subject to an examination of all that has been termed Beauty, and Taste, under the wide sense of those words as they are used by metaphysical writers. It exceeds my bounds : but the further applications cannot now be found very difficult. Let the term Taste be examined, as to any other of the subjects to which it has been applied, and the same conclusions will be found just. And thus are the remarks which I have made respecting taste in natural beauty, not less applicable to what is moral, or metaphysical. Fastidiousness, the discernment of defects, and the propensity to seek them, in natural beauty, are not the proofs of taste, but the evidences of its absence : it is at least an insensibility to beauty ; it is worse than

that, since it is a depravity, when pleasure is found in the discovery of such defects, real or imaginary. And he who affects this, because he considers it an evidence of his taste, is, at least, pitifully ignorant; while not seldom punished by the conversion of that affectation into a reality. And it is the same in Criticism, as applied to works of literature. It is not the eye for faults, but beauties, that constitutes the real critic, in this, as in all else: he who is most discerning in the beauties of poetry, is the man of Taste, the true judge, the only Critic. The Critic, as he is currently termed, who is discerning in nothing but faults, may care little to be told, that this is the mark of an unamiable disposition, or of bad passions; but he might not feel equally easy, were he convinced that he thus gives the most absolute proofs of ignorance and want of taste.

This digression was unavoidable: I may return, and to inanimate nature. This is one mass of beauty: it is crowded with beauties. Thousands of forms, and thousands of colours, all separately beautiful, and all differing in beauty, unite to surround us; so that we cannot open our eyes without seeing it. So lavish of beauty has the Creator been, that He has even placed it beneath the earth, in the mineral kingdom, under forms of crystals beyond numbering, under colours as various and as brilliant as the earth produces to the light of the sun, and under combinations, of which we may safely say, there is no end. They but wait to be disinterred, that they may be admired: and this task he has left to our own industry. It is in the same way that He has been lavish on the submarine plants, and, above all, on the shells; often concealing beauties, of colour at least, from all eyes, under that disguise which nothing but human industry can remove; as if He had

especially intended those beauties for the reward of industry and self-cultivation.

The great and wide forms of inanimate nature are such, that few can long overlook their beauties. If there is an ignorance and a want of feeling that can see nothing in the landscape, it is found only in the ruder of mankind: if there are other thousands who discern but little, the fault lies with themselves. It is the insensibility of uncultivated or grovelling minds: it is the result of an universal neglect of the mind, or it arises from an engrossing attention to the baser feelings and pursuits. No one who has cultivated the higher mental powers, can be insensible to these beauties, though he should not have bestowed a special attention on them: if he is, he ought to suspect himself. He has cultivated even his intellectual portion, on a bad system, or in a bad manner, if he is deficient in this feeling: the technicalities of some single pursuit, it matters not what, have occupied him, and to the paralyzing, not the improvement, of his total mind: he is, essentially, the pedant of one idea, or one train of limited ideas; a piece of mental mechanism, not even the philosopher that he would fain be thought. Yet the spirit of discontent can here also find its food, as everywhere else: that spirit, which, when good and evil are presented, chooses the latter, and even makes for itself an unhappy source of pleasure in censure and dislike. But he who has truly cultivated his taste, will find beauty everywhere; since even this implies a sound heart and a right spirit. Nor will he of this temper meet deformity; since he will pass by what he may not approve. This is the true secret for the discovery and enjoyment of beauty; and he who possesses it, will find beauty in everything; not in the landscape alone: while his

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pleasures will be the justly earned rewards of an amiable disposition.

It is but to seek. We shall find that we are surrounded with beauty, in every form of Nature, and in every form of Art also. I know not where it does not exist, to the eye that knows how to seek and feel it. In the great landscape, it is under forms so innumerable, that we cannot even conceive how such endless combinations and effects are produced from elements so simple and so few. If it is but a portion of that landscape, be it a mountain, a rock, a bank of earth, a tree, or even a simple stone, we find it there. Here, the vegetable world presents beauty under new modes ; adding, to their individual charms, all that results from combinations and generalizations of form, from contrasts or approximations of colours, and from the degradation and harmonizing of tints through the aid of the atmosphere. Art has never yet approached to the exhaustion of those beauties, and never will ; the labours of a life will scarcely exhaust what it might find in a single day.

It is a further exertion of the bounty of the Creator, as it ought to be a proof of His intention, that not even single forms and colours include the whole of the beauty of Nature, though they constitute the chief portion. There is an universal intention to produce it ; so that all Creation may be, in every manner, filled with beauty. The combinations of forms must ever be changing, from our own changes of place : and there is not a trivial or accidental one, that does not produce new beauty and new variety ; as even, indifferent, or perhaps distasteful objects, thus become sources of this delightful feeling. If Light is ordained to vary, under the different positions of the sun, the presence and

changes of the clouds, or the forms of terrestrial objects, to these changes has it been committed to produce beauty under new modes. The state of the atmosphere itself is ever changing ; and under each change, new tones of colour are spread over the general landscape. In all these variations, if we find ever new sources of beauty, even where the objects are unchanged, thus do even unattractive ones become beautiful : become the very pursuit of the painter, the groundwork of all the poetry of his art. These are the source of his "effects;" and in these he finds that harmony which charms even those who do not perceive the causes. Well too does he know how to profit by them : and had artists, instead of metaphysicians, written more on the subject of Beauty, many of the preceding remarks might have been spared.

But who can doubt that the Creator intended beauty, pure and superfluous beauty, in the properties which He has conferred upon the clouds ? Forms, motions, variety, endless variety, change, colour, combination, light and shade ; in everything we see provisions for beauty : and in everything we find beauty, without measure and without end. The very occurrence of comparative deformity in this part of Creation, shows us too what might have been, assures us that all this beauty was not a necessary consequence. Yet the clouds should scarcely be named as a portion of inanimate nature. He has conferred on them that life, that spirit of vitality, which, beyond all, is a never-failing source of beauty. It is in their never-ending motions and changes that we find the great charm ; for it is with this that we ever sympathize, as if it bespoke an animating soul ; that power of thought and will, with which mind ever seeks to communicate.

If I made this remark in a former chapter, I need not repeat it, as far as water is concerned. Yet I must not pass over the subject of its mobility : since motion is one of those separate sources of beauty which demand some observations. It is a cause superadded to all the rest, by the great Contriver of all beauty. The term Grace, is perhaps best and most conveniently applied to the beauty of motion ; though it is commonly used in a synonymous sense with beauty of form, or under some vagueness of application which is neither defined nor definable. I did not think it necessary to notice this subject formerly in the examination of hypotheses ; a few words now, will suffice for all. Its effect has been sought, of course, in moral associations ; that is, as usual, with peculiar human feelings, through a comparison with human motions. To this, I need make no further answer : again, one portion of the effect has been substituted for the whole ; the collateral for the primary one. If the other hypothesis has also laboured in its own way, all that it has done is to substitute one term for another. To those who delight in such analyses, it might be suggested, that the cause of the beauty of motion consists in form, since it is the delineation of a form, and in variety ; in the repeated productions of new modes of beauty. Yet even this is but a part, since its essential charm seems to lie in that which I have just noticed, the indications of life or animation, as an object of instinctive sympathy. This may indeed be termed a moral association : but it is not of the associations with which the hypothesis just noticed has concerned itself. It does not seem to have perceived this great and fundamental principle ; too much engaged in endeavours after abstruse similitudes. But whatever may be judged of this explanation, the

essential fact, here, is, that the Creator has intended to produce beauty through this cause also; without which, His general design would have been imperfect.

The illustrations that I was about to draw from water are among the most striking. There may be unpleasing forms in the clouds, but it is rarely that their motions are not graceful: in water, form and motion are, equally, and ever, beautiful. Be it the ocean in a calm, or in the fury of a storm, all is beauty: be it the gliding river, the dimpling stream, the rushing torrent, or the precipitous cascade, every motion is graceful, as every form is beautiful: and we wonder to see, that under movements so discordant and different as those that lie between the extremes of tranquillity and violence, whether among the waters themselves or their collisions with the shores, every form is beauty, and every motion grace. Could all this be, had it not been intended? and is not that intention the only Theory of Beauty?

It would be easy to enlarge on the subject of motion as a source of Beauty; but a sketch for a limited purpose cannot be an Essay. Let it be sought in the motions of animals, in the active and rapid ones especially; but above all, among the fishes and the birds. The painter has found the motions which he would fain give to the wings of tending angels, and can only indicate, in those supplicating caresses of the young dove to its mother, which I formerly pointed out: or there at least he might have done so. If he would see it in inanimate nature, let him further seek it in the movements of plants to the breeze, in the bending of the tree to the storm, and in the ship under sail. I will not here refer to the human motions, fruitful as is this source of grace, or beauty, and even exclusive as it

has been esteemed by many writers : it is the least pure case of beauty, in every thing ; for we cannot divest ourselves of the moral associations.

If I must pass from the subject of motion to that of simple form, even on this I must restrict myself within very narrow bounds. The inquiry demands an essay : I can only notice what may suffice for the purpose here in view : selecting, especially, such as most differ, since thus we may convince ourselves that the source of the feeling of beauty respecting form, will vainly be sought in secondary causes or single principles, and as vainly in moral associations ; but that all depends on the pure and arbitrary appointment of the Creator.

The straight lines and simple planes of geometry are not only beautiful in themselves, but under combinations beyond numbering : as the latter comprise an infinitude of pleasing forms, in nature and art. The simple line is beautiful in itself, and seems to increase in beauty as it is extended : we even imagine that when it is not present, by uniting distant points, or contemplating a rectilinear motion. And these lines are beautiful both in their parallelism and in their divergences. Some of the principal beauties of architectural ornaments consist essentially in the parallelism of straight lines ; the pediment depends on their divergence ; and there are few simple objects more agreeable to the eye than that radiation of straight lines from a centre, which is so often adopted in ornamental works. If there is an association with the apparent light of a star, it is the imaginary addition of the beauty of motion ; perhaps of somewhat more.

But if I were to seek any object in art especially abounding in the beauty produced by straight lines, it should be a square-rigged ship, and among those a

frigate at anchor. If I except the braces, and little more, every line of the rigging is straight. Each mast, with its shrouds and yards, presents a pyramidal outline, from the gunwales to the pole, and every separate mast upwards displays a similar one involved in the former ; while each yard, with its lifts, forms another, and all these diminishing in a regular proportion upwards. Under all this intricate combination of triangles, seeming to form pyramid within pyramid, with the steady horizontal of the yards, the further triangles produced by the several stays, the graceful obliquities of the bowsprit and the gaff, the endless catenarian curves of the sheets, braces, and other running rigging, with the delicate network of the whole mass, ever varying as our point of sight changes, the effect is that of a beauty which all can feel ; though it is the sailor alone to whose cultivated eye, the eye of taste, this carries a charm which exceeds in his estimation all that art and nature united can produce.

If a simple plane is a beautiful object, so, like the straight line, does its beauty increase with its extension. It forms a great part of the charm of the calm ocean and the tranquil lake : that of a wide grassy plain, as level as a lake, is not to be conceived by those who have not seen such tracts as that in Tirey. In the sandy desert, there is nothing to interfere with the effect. If the term sublime is applied to this and some other cases, this is seldom aught but a mode of beauty ; as the term also is often very laxly used. From combinations of simple planes, we derive the infinitely varied and beautiful forms of crystals : and these also constitute a main source of beauty in architecture, as in many other works of human art. It is in this case, especially, that one of the hypotheses has sought the

source of the beauty in fitness, utility, and so forth ; in strength, adaptation, and also in moral associations. I have but the same answer and the same appeal to repeat. The abstract form is beautiful : if an Egyptian pyramid is beautiful, so is a pyramidal crystal of calcareous spar ; but it possesses neither fitness, nor utility, nor strength. The mineralogist and the mathematician are truer judges than the theorizing metaphysician. If Mr. Knight finds that there is very little beauty felt through the sense of sight, I fear the only answer that can be given, is the proverb already alluded to.

If straight lines and straight planes are beautiful, so are curved ones ; and as the varieties of these are boundless, so do the chief sources of the beauty of form lie among them. We can indeed find distasteful curves amid this endless variety : but the far larger number are beautiful, and independently of any common relation, excepting inasmuch as a portion of any one curve must coincide with some portion of some other ; as, for example, especially, with the ellipse. A circle has been called the most beautiful of simple forms : the different ellipses are often superior, surely, since they unite variety to symmetry. The parabola and the hyperbola are beautiful forms : there is an especial beauty in the latter, as produced by a cone of light on a wall. The catenaria, the cycloid, the cissoid, and the mathematical spirals, are all beautiful : as are many more, for which there are no descriptive terms but their equations. But there are thousands also in nature, to which there are no equations ; while they are, not the less, sources of beauty. In art, I need not look beyond the forms of ships and boats, for examples in point. In these there is seldom a definable curve, and the forms of these objects vary without end : the lines on a clinker-built

vessel are all different from each other, while there is not one that mathematics could define ; yet they possess a grace, or beauty, to which no one is insensible.

Of natural examples of a mathematical curve, I know not that there are more than the sun and the moon, the rainbow and the halo, the iris of the eye, and the radiated flowers. All else, as far as I know, are approximations to some curve, or intermixtures of more than one, or utterly undefinable ; yet they are not without equal beauty. This quality is not regulated by mathematical rule, at least : I doubt if even the ellipse would appear beautiful in the leaves of plants, were it common : it is so rare that few can have seen the examples. It is here, however, that all the various produce of beauty through curved lines is best sought : in the greater number of cases in nature, the form is a solid, or is bounded by one or more curved planes. Yet I need not here make any distinction : since it is by the outline chiefly that we judge ; as being the only line on a solid, of which we can be sure. In these, the nearest approximations to definite mathematical forms occur in shells : as in *Haliotis*, *Naulitus*, *Argonauta*, and many more. In flowers, analogous solids are also common : but if they often depart from all definable form, yet without losing their beauty, so is it true, that in the outlines of leaves, portions of straight lines are often combined with curves, in every possible manner ; while the beauty of the forms becomes enhanced by the variety. It is scarcely possible to imagine a classification here ; far less a theory. The unexpanded corolla of the white *Convolvulus*, is the spiral entwining a cone, which Hogarth has selected as his especial line of beauty ; though he did not chance to know of this natural example. The unopened leaf of *Scolopendrium*

is the Ionic volute. But forms of even this inferior degree of mathematical approximation are rare ; and the more they depart from it, they are often the more beautiful. The Daisy is beautiful in the preservation of its concentric circles and the plane of its rays : the Rudbeckia is more so in wandering from both. The disk of the Sunflower is rendered beautiful by its almost mathematically curved radiations from a centre : the Radius by its laxity and inequality of surface. If the conoid of a Convolvulus is beautiful, from its truth and accuracy, the Lily is still more beautiful, from the reverse : and the Pink does not forfeit its beauty because it wanders, in every manner, from its fundamental forms. The Palmetto is beautiful in its radiation, a Grass in its simple linearity : and if there are thousands of leaves whose beauty seems to depend on their simplicity of curvature and outline, the complicated ones of the Thistles, and the inextricable intricacies of Milfoil and Adonis, are beautiful in other modes. He has commanded that all these forms, and tens of thousands more, should be beautiful : and they obey His will.

The animal world abounds in beauty of form : and these are as incapable of classification as the forms of plants ; excepting in as far as they are more limited. Those which might be reduced under some leading curves, are as nothing in the total mass ; nor are they always the most beautiful. The ellipsoidal Turtle is not a beautiful form ; the various cylindrical reptiles are not such, in comparison with many others ; and the horn of a Stag is more beautiful than that of a Ram, or an Oryx. But there is abundant beauty, and under modes as endless : to him at least who can divest himself of prejudices and disagreeable associations. If there are forms, respecting the repulsive nature of

which there is no disagreement, where also there is no offensive association, as is the case in the Chameleon and the Frog, we may not know why they have not been rendered beautiful to us also, but we are very certain that they do possess beauty in the eye of that natural taste which was given for that end; as, to us, it has been given far more widely. The chameleon and the frog are the judgments for appeal in the case of their own species: and we must not be too sure that due study would not teach us to find beauty even here; as the entomologist assuredly finds it in objects that are repulsive to all others.

Nothing can be more striking than the entire opposition among the several sources of beauty, in this case, as it is in that of plants. No forms can well differ more than the human leg and that of an Antelope, the outline of a Mackerel and that of a Dog; yet all are beautiful. The Ox and the Goat are beautiful in their angularity and roughness; the Horse in its polish and its flowing curves. Smoothness, uniformity of curvature, full and rotund shapes are beautiful; but so are the reverse qualities. And thus, on the defeat of one theory, there starts up another: the picturesque and the beautiful become war words: and no one perceives that they essentially mean the same thing, under the selection of distinct sources of beauty. Picturesque, a sufficiently ill-judged term, where every mode of beauty is the subject of painting, is a general fact, an attempt to classify some, out of the many sources of beauty: that is all. Why need I repeat it? yet it must not be lost sight of.

Everything that exists has been rendered a source of this pleasurable sensation. It was needful that roughness and irregularity should exist, as well as smoothness

and uniformity, that there should be angular forms as well as flowing curves. It has been ordained that each, all, should be sources of beauty : because it was designed that everything should be beautiful. It may be true, that this is to cut the knot, not to loosen it : but it is a knot that will not be dissevered in any other manner.

If plants have been created beautiful under every variety and caprice of form, it is of the pure bounty of the Creator ; that the vegetable world might be to us a source of pleasure. In the case of animals, that goodness seems to have been extended still further ; or, may we not at least believe it ? They were, in some measure, to be our companions or our servants ; and it was useful, both to ourselves and them, that we should love them. They were liable to gratuitous injury from our power ; was not their beauty intended as a defence ? It has proved so at least : if the effect is limited. The Toad and the Beetle suffer, where the Dove and the Ladybird escape. If this good is counteracted by the instinctive love of the chace in man, or by his inherent cruelty, even here, beauty is not powerless : where it fails, it is chiefly because it is not seen, or because the ardour of the pursuit leaves no time for reflection. Not many sportsmen would fire on the Peacock under its expanded train : and he who shoots a Sparrow without remorse, will scarcely kill a Goldfinch on its perch.

In terminating this endless branch of the present subject, I would willingly have avoided all remarks on the human form, for the reasons that I originally assigned. But as I cannot well do this, I must make them as brief as possible. Here at least, the plain road from final causes is obvious : it is the only part of the subject on which I shall touch ; because the purpose

demands it. If there was an object in creation which ought to have been beautiful to man, it was his own species. Love (I use the word in its best sense) was indispensable to the existence of society; and beauty, I need not say it, is one of the appointed means of exciting love. It is indifferent in what hypothesis we seek the sources of human beauty: under any conceivable form, we are sure that man would have been beautiful to himself. And thus in reality he is: it is the case of the chameleon again. He is beautiful under the extremities of opposed colour, under the most discordant forms that his limits will bear. A sense of beauty, to even these peculiarities and extremes, has been given: but this natural taste has not been extended beyond the range of its utility. The ordinance is as decided as it is local: and it offers a powerful argument in aid of the theory of beauty here proposed. The reasoning is the same, in comparing male and female beauty: the true solution is to be sought in the final cause; and it affords a similar argument. The beauty of the male is not that of the female: the differences are akin to the fancifully picturesque and the fancifully beautiful; and the same theory will not explain both beauties. Everything that can be demanded may still be allowed to association: but it was necessary that the male and the female should respectively think each other the most beautiful; and the taste, or instinct, is commanded accordingly.

But the simpler and sounder reasoning of an ancient philosopher, speaking, I doubt not, the sense of his age, had led him to that plain and just conclusion which a vain and fantastical affectation of fancied ingenuity has caused the writers of our own day to overlook or deny: if indeed they can be exempted from

the heavier charges, of ignorance, and of the denial of final causes. That Cicero thought, on this subject, in the same manner as I have here written, is obvious, though the remark is but a casual one: and we may regret that we do not possess more of his opinions on a subject, respecting which, an age boasting of more philosophy, and possessed of that especial knowledge denied to him, had gone so far astray. “*An tu aquilam, aut leonem, aut delphinum, ullam anteferre censes figuram suę? Quid igitur mirum, si hoc eodem modo homini Natura præscripsit, ut nihil pulchrius quam hominem putaret?*

And if any one can still doubt, that the impressions of human beauty are received through the sight, as a direct and primary impression, anterior to, and independent of, all association, I must refer him to mankind at large; since his hypothesis must have gained the victory over his own experience. Nor do I know that the arbitrary nature of this particular source of beauty, confirmatory therefore of the present general theory, is better shown than in the very unequal effect of the same forms on different minds. This could scarcely have been, if there were those fixed principles of beauty that have been supposed. It is the taste of the negro, in another shape, and for a similar purpose; but there is still the unquestionable sense of beauty. And it is an especially wise variation under a general law; indicating, as strongly as anything can do, the nature of the whole law of beauty. Similarity of form in man, was inconsistent with the order of human society; above all, as countenance, the great seat of attractive beauty, is concerned. Thence have many modes of beauty been rendered attractive: while corresponding tastes, or feelings, as to beauty, have

been implanted, that the great object might still be attained.

One further remark on this variety of countenance seems called for by the usage of preceding writers. It is matter of universal experience in the case of man: but it exists in every animal with which we are sufficiently familiar to perceive it; as it is probably a general law, though we have no means of observation. It does not require the experience of a shepherd to see, that in a flock of sheep, no two countenances are alike: the difficulty may be greater in a goose, but the keeper knows every individual. And it requires not a moment's thought, to see the utility of this in our own species: it is probably the similar source of individual recognition in all animals where it exists; as it doubtless exists wherever it was needed. It is not less a wonderful provision than a wise one: in our ignorance of its existence, we should have pronounced such distinctions impracticable by any ingenuity. An anatomist would determine on the inevitable necessity of a wide or frequent resemblance. An artist knows, that he could not, with all his efforts, produce a few hundreds of dissimilar countenances; far less, millions. In the case of a bird, where the elements of the countenance are so simple, he would fearlessly pronounce it impossible to be effected. Yet it was needed: and He who knew the utility, has found no difficulty.

I may proceed to the beauty arising from colour. I have partially considered this subject already, in the remarks on hypotheses: what remains to be said will confirm the present theory; that colour is a purely arbitrary appointment of the Creator, intended to confer pleasure, beyond utility; while it is produced by a very peculiar, though still unintelligible, set of contri-

vances, and acts on the sense of sight directly, excites the feeling of beauty, in a manner that we cannot explain, and never shall.

The compound nature of light is the source of all colour. But this, alone, is insufficient. Dispersion, through refraction and reflection, were both necessary, before the desired effects could be produced; while many different bodies have been appointed to perform this analysis of light, and also with extremely different effects. The chapter on Light has indeed anticipated what I must otherwise have said here; but I must still note the essential facts, while I refer to that place. The most remarkable, and the utterly unexplained one, is the reflection of certain coloured rays, and the loss of the rest, by bodies in which no dispersive surface can be conceived to exist, above all, where these are fluid; being the very fact whence these are permanently coloured substances. Here then is a very operose set of contrivances, and not less obscure than intricate, for the single purpose of producing colours; while if polarization is concerned in this effect, it is even more complicated and obscure than was originally thought. That the received theory of coloured reflecting bodies, through absorption, is utterly without meaning, I need scarcely repeat: it consists of words, and nothing more: that of refracting ones is comparatively simple: though I shall soon show that it possesses its difficulties also, if these have been overlooked.

But the contrivances in the nature or properties of light, do not constitute the whole of this machinery for the production of colour. There are correlative contrivances also, in the structures or constitutions of the several bodies in creation: and the variety of these is as wonderful as the structures are incomprehensible.

There are a few however which we can comprehend, in some manner, though imperfectly, as I shall immediately notice ; yet they are very limited, in proportion to the others. But they are perhaps of the most value in this argument : the bearing is the same as in the case of spectral opposition, formerly adduced. We find them applied, largely and variously, for the purpose of producing colour, and peculiar beauty of tint : they are often superadditions to a colour previously existing, as they are also supererogations of structure ; serving nothing for the other purposes of the object, and therefore invented and used for this sole end, the production of beauty through colour.

This is sufficient for a general statement, as far as the argument is concerned : some illustrations will follow immediately. But the inference is, that all this bears the marks, not simply of design, but of a most intricate and operose design, not perhaps exceeded by anything that we know in creation. The purpose of that complex design through which animals exist, is happiness : but it were indifferent for this argument what the end was, so that it was intended and has been attained. The effect produced by this portion of the total design, by the contrivances for colour, is extremely limited as to utility, but is very largely productive of pleasure, through Beauty : and we may thence infer the direct and primary intention to produce pleasure, through an arbitrary and inexplicable appointment, under which colours shall excite a various sense of pleasure through the sense of seeing.

The principle of dispersive refraction is the most simple ; though it is that which has been least widely applied in nature ; if, however, more widely than philosophers on light seem to have yet perceived. It is

the sole source of colour in the rainbow ; and the chief one, at least, in the clouds ; though in this case, and in that of the blue sky, it is difficult to conjecture what belongs to refraction, and what to dispersive reflection. But its most multifarious application is in flowers ; and this is the case to which I just alluded, where a double supererogation is adopted for the production of this effect, the beauty of colour. It is, equally, the case which the usual doctrines of the prism do not explain. Let the refracting bodies be globules, as they appear to be, or prisms of any form, no theory will explain why, on any given flower, they produce only one colour, under whatever angles they are viewed, or why some refract white light. That the principle of dispersive reflection is often superadded, is probable ; as, in some, it is apparent : but in structures so minute, it is at present impossible to disengage these two circumstances. I said that this principle was superadded to that inherent colour in a flower, which is the most unintelligible contrivance of the whole. This, we can extract ; and all we know is, that it seldom approaches to the tint which the flower itself displays, as is remarkable in Borage, and in the Geranium inquinans. Here, the superficial structure performs what the inherent colour could not, by returning, exclusively, blue rays and red rays : while it seems at present hopeless to inquire into the exact nature of that action, as related to the internal colour and to the solar light. But whatever the action of these superficial appendages may be, they are easily seen in numerous flowers : very distinctly in some of the genus Amaryllis, but as far as I can recollect, most conspicuously in Cactus speciosissimus ; where, producing the yellow light of the topaz, they emulate that gem in brilliancy ; thus becoming the

joint cause of a splendour of colour which perhaps could have been obtained in no other way : as that yellow light, united to the crimson basis, produces scarlet. And the brilliancy of the white flowers has been augmented in the same manner : in the *Narcissus poeticus*, and others, a singular superficial structure returns white light.

The principle of dispersive reflection, arising from an assignable surface, is visibly applied in *Adonis autumnalis* : as it doubtless is, much more widely ; being also united to local and fixed colours. In a lateral view, this flower is of a dead crimson ; while it reflects a full scarlet light upwards : so as to lose its colour when taken into the hand. The Sturms and Harveys would find matter for their usual meditations, in this. But its most extensive application is to the colouring of fishes and birds, as I formerly remarked ; from the simple iridescence of white surfaces in the former, to the fixed colours of innumerable birds. And here also, it has been applied to produce that effect which is so rare in flowers, and so limited,—mutability : the familiar cause of the endless splendours of the humming-birds and many more.

The principle of spectral opposition is, comparatively, a partial contrivance ; but I may note, as I formerly promised, a few of its applications. In the highly-coloured birds, it is frequent, under the intermixture of green and crimson, and the changes from the one to the other. It is the same, less strikingly, in the blue and yellow Macaw : and it is also common in fishes, under different modes. But it is most accessible and common in flowers : although unobserved by the multitude, unacquainted with the existence of such a principle. Hence they are often surprised to find that

the flower in the nosegay or in the drawing, is not what it was before it was plucked ; having destroyed, or neutralized, or counteracted the principle of beauty which nature had provided. The green calyx and leaf of the Rose render its crimson more intense : the lilac or purple radius of the Dahlia enhances the yellow of its disk, and the reverse: each gives to each a double charm. Thus also with the Pansy, the Tulips, the Asters, the Convolvulus, and many more : while the minuteness of the application in some of the radiated flowers, by adopting two colours in the rays, as in Chrysanthemum and Coreopsis, is often very remarkable. There are also many other analogous contrasts for the production of beauty in this tribe, though we do not know that they are properly spectral, and do not indeed know to what principle to refer them. Such are, brown and yellow in approximation, as in Tagetes, and black and yellow, as in the Pansy : the effects of which are felt by all persons ; and possibly still more in the Wasp, and other similarly coloured insects, than in any flowers. But as I might make these illustrations too long, I shall simply notice, that some other principles which painting acknowledges, are equally applied to the production or enhancement of the beauty of colour, in various departments of nature. The cold crimson of a Rose is warmed by the colour of the anthers : the star of the Peacock is a judicious intermixture of cold and warm tints, with a gradation superadded. But it suffices to examine the Venetian and the Dutch schools of colouring, to perceive, that if these did not borrow from the colouring of nature, and of animals especially, their systems depend on principles, of which nature has made a large use, as all can see the beauty of the result.

If these are contrivances, of which we can comprehend something, as we perceive their applications, they would all have produced but a limited effect, had there not been much more, of which philosophy can give no explanation. To our experience, hundreds of different colours are fixed in bodies, solid and fluid, as if they were substances, or a portion of the body itself; as, in practice, they are inseparable from it. They are miscible, and transferable: as if colour was what the dyer and the colourman consider it, a thing to be measured and weighed. Even they who know that it is an effect, and not a substance, cannot easily conceive it otherwise. Of the cause, I have already said (c. 36), philosophy knows nothing. It cannot be structure, when the same fluid will reflect and refract different colours: we cannot conceive a dispersing surface in a fluid; or in a solid on which we can produce actually dispersive surfaces, again removing them; or in a solid which can be everywhere rendered surface, and when the microscope, assigning real dispersive surfaces, can discover no structure, or sees that numerous surfaces reflect one colour. There can be no theory on this foundation, when a coloured solid retains the same colour in solution, as a fluid: when the colouring fluid of a Cactus can be solidified in an insect, again dissolved, and once more solidified in clay or silk, yet under all these changes producing red light, and, when fluid, by refraction and reflection both. To notice the broken or compounded tints, is but to add unnecessary difficulties, when everything is inexplicable. Yet is this the great contrivance of the Creator for producing the beauty of Colour, and for rendering it widely beautiful: even putting it into man's power, as if He had made coloured light, itself, a thing to be weighed

and measured and shaped. There is nothing left for us, but to accept it as a fact; as it is that also of the widest application in the present case. The contrivance is in the body; be it what it may; and it must be exceedingly intricate, that the colours may be correspondently numerous.

I need not now repeat, that beneficence was the chief intention in all these contrivances; but it is right to remark, that while colours are widely the sources of pleasure, they are scarcely ever the cause of pain: a rare occurrence, in this world of mixed good and evil. Associations may, as usual, render some displeasing: if there are disagreeable combinations of colour in art, it is rare to find such in nature: while we have the power of exclusion, the absolute remedy, in our own hands. It is but too true indeed, that familiarity makes us overlook all this beneficence: it may be of some value therefore to have shown, that there was neither casualty nor necessity in this case. The blue sky and the splendours of the earth were not undesigned: nor will he think thus, who is willing to take that view of Creation which I have everywhere attempted to inculcate.

The important purpose in view, in this inquiry, ought now to be accomplished. I need not again say, that the direct impression from colour, is pleasurable,—that colour is Beauty: it is sufficient to look at a web of scarlet or azure silk, to be convinced. But I may refer to what I formerly said in answer to one of the hypotheses, for that which would otherwise have found its place here. The effect of a single colour is like that of a single musical tone, or a pleasing odour: it is an instinctive feeling; a law of our nature. And whatever additional pleasures there are, of a more compound origin,

I have already stated, and illustrated them, as far as seemed needful, and, within my limits, possible.

To point out the cases in which this kind of Beauty exists, would be an endless and a superfluous task; pleasing as the subject might be rendered. Yet let not the reader forget the pleasures, from this source, which are scattered around him in such profusion, and which meet his eye wherever he turns. Simple attention suffices to obtain much enjoyment; since colour is beauty which even the most uncultivated can feel: but it requires a cultivated taste to be sensible to all which this mode of beauty can effect; to the higher and more refined pleasures derived from colouring. Hundreds may feel pleasure from the evening sky or a parterre of flowers; but it is one that would not divert them from the lowest animal gratifications or pursuits. It is he of a cultivated taste alone, in whom the pleasures of the mind have been taught to triumph over mere sense, that will feel all the beauty, even of a flower, simple as that is; far more, who will hourly, and ever, feel that he is living in the midst of a world of beauty, an universe of delight.

Yet it is surprising to observe how limited the sense of the beauties of nature is, not only as to this class of objects, but to all others; not merely in the baser and uncultivated minds, but even among those who are sensible to the beauties of art, or who at least imagine that their estimation of those proceeds from a perception of their beauty. If I cannot here take room to say how very minute a portion of mankind, even among the educated, see beauty or find pleasure in the landscape of nature, or of how very recent a date is, among ourselves, the bare conception that such beauty existed, it is nevertheless true, that of the thousands who admire,

or profess to admire, a picture, there is seldom one who would have observed the beauties of that original which it represents, though so far superior, or could see them if pointed out. On this and its causes, I cannot here enter: but be the works of art what they may, they never approach in beauty to those of nature, except in those rare or peculiar instances of the poetry of painting, which nature cannot easily give as the imagination does; though she still affords the materials, and is still occasionally also such as to exceed all that man's imagination can produce.

And while the beauties of art are rare and costly, and thence also confined to the enjoyments of the few, those of nature are the free property of all. There is no canopy like that of the sky, and all the ceilings of architecture disappear before the ever-changing beauties of its clouds and lights and colours. In the presence of the rainbow, who is there that would look at the colours of congregated gems; or even perceive that diamonds were at his feet, when the stars are scattered in their countless profusion, far beyond him? It is with difficulty we refrain from a warmer sentiment towards the bright and quiet moon, as if itself were a thing of feeling and thought: and if man has "kissed his hand" to the sun in his splendour, can we wonder at it?

Man has never even woven a tapestry like that which May spreads beneath us, in its green and flowery meadows: and where are the imitative works of art that can compete with a flower garden, can even approach to a single flower? But we admire the imitations, and almost forget to look at the reality and the original. Yet while the former are costly, or even inaccessible, the others are given freely, without cost, and they are

given freely to all. The Creator has even empowered us to create for ourselves, and almost without labour, beauty which no art can approach, and no price could teach it to rival. We sow a few seeds, in a few minutes ; and we become artists, under the kindness of the Great Artist, producing pictures, imperfect imitations of which we must have purchased with gold, as not all the gold of the universe could have stimulated an artist to approach to them.

And why is not the far more beautiful original preferred to the infinitely remote copy ? Is it that it is transitory ? It outlasts perhaps our sense of enjoyment ; but it is ever multiplied around us, and ever renewed. Is it that it is easy of attainment, that it is common, that all can equally enjoy it, that it is without price ? These are its merits. It is bounty superadded to beauty, on the Creator's part ; it is beauty which requires no appropriation that it may be enjoyed, and therefore too is it pure beauty. He who makes these objections, may enjoy some other kinds of pleasure from other sources ; but he knows not the pure pleasures that arise from the sense of beauty. These demand neither value, nor appropriation, nor exclusion : yet not till we have learned to separate these far different, and often base feelings, from the genuine and pure love of beauty, shall we know how to profit by all which the immeasurable beneficence and profusion of the Creator have spread around us.

But it is a far higher mind, commanding for itself pleasures more abounding, and of a much superior order, which has cultivated the universal feeling of beauty, in all its causes and principles ; hence increasing its sensibility and enlarging its discernment. Thus, the pleasures which once seemed to be those of a mere

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sense, become associated with the higher and more refined pleasures of mind : the beauties of nature become the poetry of the visible Creation ; objects of the sentiments, the intellect, and the imagination : they become what they ought to be, for they belong to all of those : they become what they were intended to be ; and this is the reward. It is well worth the labour by which it may be obtained : it is amply worth the ambition of reasonable man. And the basis as well as the objects, may be given : but, without cultivation, this never was attained, and never will be. And is it not an inducement also, that every step in this progress is pleasure ? for wisely and kindly has it been ordered, that the unattained shall not be a source of pain, shall scarcely even be suspected to exist.

But if he who is insensible to the beauties of Creation is to be pitied, that man is even culpable, who, seeing and feeling them, suffers them to conceal the Creator from his eyes and thoughts. And though he were rather pardonably careless than blameworthy, he forfeits that great source of intellectual pleasure which arises from tracing design, and attempting to penetrate the intentions of the Designer. And even all these pleasures will multiply themselves around him who has taught himself to see, in all this, the soul of Beneficence ; as this will add an interest, for the want of which there is no compensation. This is he who will see Goodness, not less than power, in the great and wonderful universe, where Power is ever written in characters of light ; but who will see it also in the most humble flower, which the careless eye overlooks and the rude hand destroys ; seeing, everywhere, throughout all the world of ocean, earth, and sky, the Beauty of Him who is good as He is powerful, the Beauty of Goodness.

CHAPTER XLVIII.

ON THE PLEASURE PROVIDED THROUGH THE SENSE
OF HEARING. MUSIC.

IN proceeding to speak of the sense of hearing, as an appointed means of pure pleasure superadded to utility, I need not say that the question is that of Music. If the sacred poets have given this source of pleasure a place in those regions where no other human pursuit or pleasure has been admitted, they have at least shown that they had separated it from the pleasures of mere sense. And justly. Like visible beauty, it is a mental pleasure, of a higher order : no one who reflects, will rank it with the mere pleasures of the inferior senses. If it is a source of delight, like the beauty of colours, to all, even to the rude and uneducated, its resources, like its pleasures, are boundless, as are those of visible Beauty : and, like that also, it is deeply connected with the sentiments, or the moral feelings, and with the higher states of intellectual cultivation. Thus also is it connected with the imagination : there is a poetry in music, if it is not the poetry of language. To answer the objections to all this, made by the metaphysicians who have written on what they neither knew nor felt, is vain : it is to reason with those who were equally insensible to visible beauty ; to attempt to convince the deaf and the blind ; ever the most loud and decisive judges in all these cases. Like Beauty

too, its cultivation holds out the rewards allotted to exertion, and commonly reserved for that; and, like beauty, it is an almost unmixed source of pleasure, unalloyed by suffering or regret, to be indulged without vice or repentance. As a pleasure of the imagination, it cannot even be perverted to evil, as poetry has been: if evil has been objected, as following its cultivation, it is but evil that may be associated with anything.

If music has been styled a Divine invention, and a Divine art, there is more truth in this expression than that phraseology often contains. It is truly an art of the Creator's own invention. It is contingent on nothing. It is not a necessary result of any other arrangement in Creation: it is a pure and arbitrary appointment, an independent invention, connected with nothing else, and intended for a special end. Like the beauty produced through form and colour, it is an invention for the sake of those sentient beings whose organs of sense have also been constructed and adapted to feel it: intended for their gratification and pleasure; and though not solely, yet most perfectly and extensively for the happiness of man. It is a direct and arbitrary appointment for this end: and the general reasoning continues to be that of the preceding chapter.

I shall therefore examine the question of its nature, on the same grounds: the Will of the Creator, and the final cause. And the conclusion must be the same, if I can show, that nothing but an immediate reference to the First Cause, can explain the source of music, or the double provision for the production of pleasure, made, in what we believe to be the vibrations of elastic bodies, and in the sense of hearing, or the mind. And if it should further prove, that the foundation of all

Music is even more arbitrary, and more independent, than that of Beauty, that it is connected with nothing else, nothing beyond the immediate causes necessary to produce sound or tone, that this arrangement or law is a sole one, accompanied by a special correlative instinct, equally independent, and adapted to feel this peculiar pleasure, the intended conclusion will be drawn in even a more satisfactory manner than in the case of beauty ; as the pure and absolute inutility will also show the inference respecting the beneficence of the Inventor in a stronger light.

If, as in every other case, the vanity or the ignorance of philosophy has desired to account for the existence of music, by attempting to refer to certain secondary causes, or if the motive has been to exclude the First Cause, it has been singularly unsuccessful : while not even ashamed, as it ought to have been, under the assumption of science, of having left far more unaccounted for than it had laboured to explain, as of its feeble and purposeless efforts to explain anything. In the present day at least, we are entitled to something better than the philosophy of Pythagoras and Aristoxenus : if metaphysicians were long in discovering that the vibrations of Hartley, and the atoms of Leibnitz and Boscovich, deserved no other fate. Whatever the classifications, mistaken for causes, have done respecting beauty, they have not succeeded, even to this poor and deceptive extent, in Music. And the theory of moral associations has failed so remarkably, that it is surprising how its almost ludicrous efforts and circuitous labours did not at once attract attention to the feebleness of the entire hypothesis. I may refer to an author, as slight as he has been lauded, whom I desire to avoid naming.

If we are essentially ignorant of the cause of sound,

of almost all, indeed, to which the term Acoustics has been applied, we still know, that a definite number of vibrations in a given time, performed by an elastic body, will produce a certain musical tone, that a certain other number will produce another, and that these tones may bear pleasing relations to each other, or the reverse; while the first has been termed concord, and the other discord. Now the metaphysicians of this science, if I may give them that name, have found, or supposed, that the pleasing relations depend on the more numerous coincidences of the vibrations in any two such notes, and that the unpleasing ones occur when the coincidences are few and distant: and thence they have sought the source of the pleasure of concord in arithmetical relations. Thus have the metaphysico-mathematical inventors of a Theory of music deceived themselves, and succeeded in misleading others: as the same race has done in so much more. It might be deemed extraordinary, in the first place, that a pleasure of this nature should depend on such a cause; and not only so, but that the peculiar pleasure felt from every separate concord should depend on numerical relations, of which the hearer knows nothing. But the question is one of sensation, not of mathematical relation: and this they have overlooked, while it is the only test. That there must be means used to produce an effect, no one doubts: but what is the connexion between the two, and how is one the cause of the other? This theory is the expression of a fact, in other words: it leaves the essential question where it was.

But what also, if it be not true, even in what it asserts? The most perfect coincidences are those of the unison; they are absolute: but the unison is not a

source of the pleasure of concord: it is nothing at all. The next is the concord of the octave: but every one knows that it is nearly neutral, as a source of pleasurable sensation; as all musicians know that its repetition on other tones, is, in particular circumstances, disagreeable. I need not extend these remarks to the fifth and the third; since I am not writing an essay on music; but the conclusions are similar: the most perfect concord of these two, is the one that is most easily dispensed with, and is also the most liable to become offensive. We are told that this is the consequence of being too beautiful; that it cloys the ear: it was necessary that the mathematical theory should find this reason. But it is never perceived, that the fallacies all rest on the assumption of two terms; invented by the hypothesis, in due conformity to its principles. Concord must be agreeable; discord must be disagreeable: common associations help the effect of this hypothesis. And therefore, one of the most pleasing associations of sound in the scale, the flat seventh, must be termed a discord: it does not conform to the mathematical laws. The major second is a most violent discord: but what if it constitutes a very gratifying coincidence of sounds? And musicians themselves, ignorant, it must be presumed, of what they were doing, and taking the hypothesis and the terms on authority, have sanctioned and confirmed all this, by their phraseology about preparations and resolutions of discords, and by much more, on which I cannot here enlarge; wrapping plain facts up in a jargon which not even themselves seem to understand, as they are ever changing their systems. A plain understanding would find no difficulty in pointing out what was agreeable or otherwise, without this idle phraseology: a certain succession is

pleasing ; another is not : it is a question of sensation, of feeling. And such is the whole question : there are no rules but the rules for beauty : that which is felt to be beautiful, is beautiful. It would be easy to enlarge on this subject, to the extension of the same general conclusion. Whether the earlier musicians were misled by this hypothesis, or by their own want of cultivation, is of little moment : but the latter is the probable fact. They found beauty in a succession of fifths ; in that which is now unendurable : what they rejected as insufferable discord, or used sparingly, is now largely used, and is found to be the most delightful harmony, if the definition of harmony is to be, that which produces the pleasure from agreeable sounds.

I dare not, here, enter further on this subject : what I have said ought also to suffice for the object in view. But the foundation of all harmony, as of all music, is the musical scale ; and, of this, I can find no explanation in any hypothesis. The same words may indeed be found, distributed in another form ; but that is all. And an hypothesis that cannot explain this, has done nothing. It is the very question between the Creator of music and him for whom it was created. No solution of this can be given, but that it is a law of nature ; of our nature, as of those among the animals which produce and feel music. And this is to say, that the appointment is an arbitrary one ; depending, simply, on the will of the Creator. Be it produced through whatever numbers or relations it may, these do not account for its peculiar, or pleasurable effect. Far less will they account for that, when we examine the singular irregularity, or irritation, which pervades it, under certain wider relations. But, above all, there is nothing that explains the mystery of the key note, of that point

in those relations, which we feel to be the point of rest. Without that point of rest, or reference, we can conceive no music ; though all else, if related, or concordant sounds, should remain : it is the foundation stone ; though we know not why it is that foundation, or how it was fixed. And again, we are compelled to conclude, that it was established as the foundation of melody and harmony, because such a one was needful, for the purpose intended ; the final cause.

The limitation of the scale to seven notes, is another equally inexplicable law : but it is as nothing, when we come to examine the other facts belonging to this singular contrivance. It would have been a natural expectation, that it should have been formed from notes at equal intervals from each other : if a juvenile musician thinks at all, he is surprised to find that it is not so. The intervals are not only unequal, under great differences, but are distributed in a very peculiar manner. It was not a natural expectation that there should have been two scales to one key note, under a different distribution of the two shorter intervals : yet there is a major and a minor scale. If there was no apparent reason why each of those scales should be limited to seven notes, it is still more remarkable, that two of these can be omitted, and that the scale of five notes, the Oriental scale, constitutes a similar and equally definite musical phrase, applicable to the production of melodies. In the minor scale, moreover, there is a very singular anomaly : for which, equally, no reason can be assigned, except that the feelings demand it. In descending, the seventh must not be a semitone, as it is in the major scale : but, in ascending, that is indispensable : while there is even another well-known peculiarity of a similar nature.

But the minute irregularities to which I just alluded are still more remarkable. The difference between a tone and a semitone is a broad one: but the several semitones are not separated by equal intervals: whence the necessity of that which is called *tempérément*. Here, expectation is again disappointed: while the arrangement also appears especially capricious. An ordinary ear, too, knows nothing of this; but believes all the semitones, at least, similar; as it finds no reason why they should be otherwise. Yet is this one of the most beautiful of these inventions. The total scale serves the purpose of a purely chromatic, or semitonical one; while, by means of this further refinement, it gives musicians those enharmonic chords which are of such powerful effect in music. He who does not see design, as well as ingenuity, in this, can never have considered what design means.

The different effects produced by scales formed in different notes of the chromatic one, are equally unaccountable on any other principle. This has been so long a difficulty with musicians, that they who must account for everything, have even denied a fact known to every one. No one can say why the minor third is a plaintive interval, or why that scale is so: and when we are referred to the usual explanations, we find that these are identical propositions. The most perfect major concord next to the octave, the fifth, is a plaintive interval also.

On all this, and more than I can here afford to notice, there can be but the one conclusion, so often made, in the preceding chapter, as in this one. The whole system of the scale, or the system of music, is a design of the Creator intended for our pleasure. It is also a very complicated and ingenious one, from the

great diversity of effect producible under an apparently small number of tones : to those who can compare it with other contrivances in nature, on the broad principles so often stated in this work, it will appear an equally remarkable union of simplicity and ingenuity ; as, in this combination, we find, not only a provision for a general end, but for special ones also. The broad simplicity, appearing to be exclusive to ordinary or uncultivated ears, serves to produce that music which is satisfactory to such limited faculties : the involved contrivance, discernible through higher sensibility, natural or cultivated, becomes applicable to the higher gratification of such feelings. The whole bears a sufficient analogy to the different effects of what may be distinguished, as colour, and as colouring. He who can doubt that it constitutes a regular and intended contrivance, a design for an end, as demonstrated as the design for the production of colour, has not made much progress in reasoning, or has never yet looked at Creation as the work of a Creator. And he who, finding a correlative faculty or instinct, commanded to discern and feel the contrivance, seeks for other causes than the will of the Contriver, will seek in vain. It was intended to produce pleasure, through music : some means must have been adopted : but had they been any other than that they are, we are sure that the end would have been equally attained, through a corresponding adaptation of the instinct. The scale of music is therefore an arbitrary one : there is no solution but the will of the Creator, no cause but the First Cause.

To enlarge on these facts, or to pursue the subject through harmony and melody, would be unfitting for this place : as more minuteness would also render it less intelligible to general readers. They, however,

who explain the pleasing effects of melody, by referring them to harmony, should recollect that the source of the pleasure of the latter remains unexplained. More, however, has been done for melody, by means of time, accent, rhythm, and so forth : while, if the obvious nature of these to us, seems to exclude them from the design, it must be asked who taught them to the bird creation. They form the right hand of melody : if musicians, ever labouring, to obscure the doctrine of harmony, have forgotten to write about that, without which they could not proceed a single step.

But there is yet an inexplicable invention for the sake of music, which I have not noticed, and which has been entirely neglected, both by writers on acoustics and on music ; although musical composers have, recently at least, applied it largely to use. I cannot discover that the former have even attempted an explanation : they could not but know of its existence ; but they seem to have been quite insensible to its power. That the latter have not attempted to explain its effects on the mind, is well : since it gives me no rubbish to remove, in stating it as another of the arbitrary contrivances for producing music or enlarging the sphere of its powers.

I allude to the quality of musical sounds : and it is a sufficient proof, of our own neglect at least, that there is not even an English term to express it. I must borrow the word Timbre from the French : though it remains equally undiscussed everywhere. If the science of sounds does not account for this, as I know not what there is which it does explain, nature teaches us to feel the distinctions, and with results which ought to be well known to every one. That there must be essential distinctions, philosophical or mechanical, can, however,

admit of no doubt, from the relative powers of those sounds in making themselves heard, even when the tone is the same, and where there is no sensible difference in the quantity or loudness of the sound; and not less, where that can be proved infinitely greater. A single flute is heard among a thousand violins: when a hundred violins in addition would not make a sensible difference in the mass of sound.

And timbre, simply without reference to scale or key-note, and independently of both melody and harmony, other than the inherent harmony which all sounds seem to include, is a source of pleasure, or is beauty to the musical sense. It is like a simple colour: and there are differently pleasurable timbres, as there are differences among the colours in this respect. Every one feels the differences of sensation, as of pleasure, in the same tone as produced from a trumpet, a flute, a violin, a musical glass, and so forth. And not even any mode of execution, under a single melody, can equalize their effects. The French horn and the trumpet are ever different; intimately allied as these two instruments are: and, similarly, no management of the hautboy can give it the plaintiveness of the bassoon. The violin, with all its powers of expression, is foiled by mere sound; by simple timbre. The singular powers of different timbres in combination or contrast, are not less remarkable; if unknown to the earlier composers, and but sparingly adopted, even by Handel; whom they would so essentially have served. This is the great improvement which we owe to Germany: derived, doubtless, not from reasoning, but from experience respecting military instruments. It is the well-known charm of Mozart's "Secondate." And it forms a large portion of the effect of the organ:

while, that it is destined to effect yet more, through the invention of new instruments, I have no doubt: through that mechanical contrivance which has ever antecedent musical invention.

If this also, under greater nicety of refinement, constitutes the difference between a good and a bad instrument, that is especially remarkable, to us, in the human voice. It is little noticed, that this is the fundamental charm; that which nature alone can give, which no powers can replace or supply, which does more for the singer than all else; often, for the popular singer, doing all. And not very unjustly: since it is that which most affects the mind, or, in popular phrase, reaches the heart. The unmodulated tone does this: but there is scarcely even "expression" without it. It is the same for the orator, under whatever mode: for the declaimer and the reader. I need not quote instances; but there is not a modern orator at least who would consent to exchange tone for "action." Nor need I quote poetry, in proof of its power, in the female voice, under the ordinary course of life. Like visible beauty, it is a well-known source of attraction.

But it is not to music alone that this invention has been applied: and though any one should choose to doubt the design in this case, those doubts must cease, when he considers the great ends to which it is applied, and the absolutely marvellous variety of timbre which has been established for those ends. The invention of odours might have appeared surprising: but this is as nothing compared to the endless tones of the human voice, did I even omit all other animals: as it is also an especially difficult case, since these are minute variations under a leading timbre. It would demand some labour, to find even a hundred violins of dis-

tinguishable qualities. And it is a ground of distinction and recognition ; as the varieties of countenance are. We also know it to be that in the sheep, and under an equally inexplicable variety. Every mother knows the cry of its own lamb, as I remarked in a former chapter (c. 22) where this subject was necessarily noticed ; though we cannot, ourselves, make the distinction. It is probably the fact as to all other animals ; while it may sometimes aid, as I then observed, to form that natural language which we cannot discover : and, for the plain reason, that our organ of hearing is insufficient, or has not been thus adapted.

If these are purposes of utility, I must not quit the subject of timbre, without noticing some other pleasures derived from it, though not strictly belonging to music. They are well known : yet perhaps less noticed than they will be by those who shall now attend to them, under a reference to this principle. The murmuring of waters, the tinkling rill, the whispering winds, the sound of the forest in the blast, the rush of the cascade, the roaring of the ocean, and the voice of the thunder, are scarcely more than the effects of simple sounds. The harmony of the groves, as it is termed, is often also little else. Even the little musical sounds of other animals produce similar effects ; as the union of sounds, so unrelated and so unmusical as the lowing of cattle, the bleating of sheep, the cawing of rooks, the cooing of pigeons, and even the woodman's axe or the smith's hammer, with the sheep bell, the cuckoo, the evening song of the thrush, and the distant bells of the village, often produce a rural concert, which few can feel without emotion, though even a refined musician might be extremely troubled to point out either harmonies or melodies. These are the rural

sounds which the poet has celebrated. That their effects have been sought in associations, is true; or that they imply pleasing associations, enhancing their charm, no one will question: but there is no musician who cannot distinguish the primary beauty, as it is he also who will feel the effects in the most lively manner.

Before quitting this subject, I must yet notice a circumstance relating to music, to which I only alluded in a former part of this chapter; because it seems to me a further effect of the beneficence of the Deity under this design. This is, its power of parallel progression with man himself; so as to be a cause of pleasure to him in every condition, from the utmost rudeness to the highest improvement. And, not to discuss a well-known and hacknied question, that pleasure is, to him, equal, or at least sufficient, however rude the music: he enjoys it as much as he can; while the cultivated musician can enjoy his own no more: and, not seldom, the former has even seemed to laud it more warmly. Allowing much for the exaggerations of poetry, and not to enter on the tormented subject of Greek melody, such seems the explanation of the wonders related of this very disputable music. Pure pleasure was intended; and it has been given to all states of man. Had no music but that which we esteem, existed, rude man would have wanted some of his pleasures: had it not been progressive, cultivated man would have left a great source of pleasure behind him in his advancement. And it is progressive: how can we decide that it is exhaustible? Every fresh period of this art has believed that invention was exhausted; yet new ones have arisen in succession, and the end may yet be far distant.

I must, however, pass from a subject too pleasing to be quitted without regret, yet of an extent with which I dare not here cope. But if I have noticed this invention of beneficence, only as it relates to man, it has not been limited to him alone. The conduct of the musical birds can leave no doubt of the pleasures they receive from that which, in them, we cannot well call an art. The contrivance of their organs is destined to this very purpose ; and though it should be true that the song is not instinctive, but the result of education, it is indifferent : since the facility with which they receive even a varied musical education, bespeaks the existence of an appointed musical faculty ; of "ear" and memory. They have been instructed too in that accent and rhythm, without which there is no melody ; and in that swell, and prolongation, and contrast, without which there is no expression. Of the beauty of their tones, I need not speak : but it may be suspected that to themselves, as in all other animals, the timbres possess a far greater variety than they do to us, who feel them as little else than slender modifications of one quality of sound. The refinements of their musical scale bespeak a nicer faculty of discrimination than our own.

That they possess a musical scale, as well as ourselves, there can be no doubt ; if this has been questioned. But for a similar contrivance, or canon, there could be no precision or constancy ; no memory, no song. If asked what that scale is, we ought to infer, *à priori*, that it is our own, because the intention was to give pleasure to us, as well as to themselves : there should be but one musical scale for all, though all may not make the same use of it. And the facts justify the conclusion ; as far as our comparatively indifferent ears enable us to examine them ; while, whether nature has

assigned them a fixed key, or whether, as has been said, they vary their keys so as to suit a given note, the consequence, with respect to a general harmony, is the same. It will as little be maintained that the birds possess many different musical scales, as that they possess none : this would not be reasonable, on general views of creation : nor will it suit the facts, as I shall presently show. Now there are a great many that sing in The scale of music, and, much more widely than is suspected, even in the diatonic one ; still more widely in the chromatic : while there is far less of inharmonic melody among them than is supposed by those who have not paid to this subject the joint attention of a musician and a naturalist. Barrington has said truly, that they who have most opportunity of listening to the singing of birds, pay no attention to it : musicians perhaps have little opportunity. The notes of the Cuckoo are known to all : they are a major, and a minor third ; at different periods of the summer. In the Yellow-hammer, the song ends in the third above : the Curlew's plaintive cry is the interval of the sixth ; I think that a nicer ear than my own would be sure of some refinements on this chord, which I believe myself to perceive. The diatonic and chromatic notes abound in the Nightingale's song, as they do in that of the Thrush. But to cut short an enumeration easily lengthened, it requires little attention to perceive them in the Chaffinch, the Robin, the Wren, the Titmouse, the Blackbird, the Goldfinch, the Linnet, and in all the Larks ; above all, in the Woodlark. The notes of the domestic fowl have even formed the foundation of a well-known quintetto, in the hands of Boccherini ; and the subject of Beethoven's symphony in c major, is a passage in the song of the Blackbird.

In reality, all birds make a far larger use of even the diatonic intervals than has generally been suspected; while that which appears to have misled inattentive listeners seems simply this. They make a frequent use of the minor divisions, or of an enharmonic scale; and, to this, our ears are either not sufficiently formed, or not sufficiently educated: in melody at least. The best musicians scarcely know how to estimate those small intervals, except under harmonic combination. If the Greek music was that enharmonic music which it has been thought, an ancient Greek would have decided this question for us. Future musicians may do it: such melody is not an improbable result of the present progress in refinement. And we ought to believe that these natural musicians feel, on this subject, what we have not yet attained; gifted with fine organs of hearing, as with superior powers of vocal execution, and fully sensible to the music of their own production. If it were not so, whence should the song exist? it is the ear that directs the voice: the interval is in the mind, or it could not be executed.

Such seems the foundation of a phrase used without any meaning—the harmony of the groves. If I mistake not, it is truly a harmony, though not the broader diatonic harmony to which common ears are alone sensible. If there are interfering sounds, as cannot fail, it is a property of the principal ones to rule or suppress these, in other well-known cases. A musician easily aids this; by rejecting them, or bestowing his attention on the others; as perhaps all do in some manner: and thence I think it will be discovered, that this harmony is a very real one, belonging to the general canon of music, and that such is at least one source of the pleasure it affords, even to those who cannot explain it; affecting them as harmony, not

simply as melody or timbre. Among the sea-birds, little suspected of melody or harmony either, it is so perfect, that he who, as a musician, could hear what I have often heard, and what any one may, would even be reminded, in almost every effect, of compositions so well known as the final scene of the first act of the familiar Tancredi, and the not less familiar "mi par esser" in the Barbière. If the Creator has given to those little creatures that which He has compelled us to acquire, it is no more than He has done in the case of the Bee and its geometry. The never-contravened command to us, is, Labour, that you may deserve your enjoyments.

It is a natural question, whether the animals which cannot produce music, enjoy it. If it could be proved, it would be a great extension of this mode of Beneficence. We are deficient in information: but the probabilities seem in favour of this conclusion. The extent of the pleasure, or its discrimination, above all, will never be known. But that many animals are attracted, at least, by musical sounds, is familiar: it is likely to be far more general than we know. It is even true of fishes. It might not be a very fantastical supposition, that the singing of birds was some cause of pleasure to all the surrounding animals; and if it were but the pleasure from mere sound, the end is still gained.

But how could it ever have been doubted that melody was a source of pleasure to the birds that produce it? The evidence confirms the *à priori* inference from the contrivances. The joy is demonstrated in the very act of singing: it is not so evinced in ourselves, even when song is the produce of an overflowing heart. It is the amusement of the fresh morning, when bounding in spirit: it is the effect of sunshine and brightness, of

youth, and love, and the early year. If it is the effect of food, it is because, to the inferior animals, food is the great enjoyment. It is a sickly sentimentality, or the cant of imaginary politics, to pity the singing-bird in confinement : it is happy, because it is fed ; and its song is the expression of that happiness. They salute those whom they know with songs, they emulate each other in song, the mere sound of music excites it, and a single songster will rouse the whole grove into harmony. Has it been questioned that the male sings to amuse its sitting partner ? He will not doubt this, who has seen the Swallow, at early morning, perched on the edge of its nest, singing to its little progeny, with its head plunged among them, then erecting itself, and again renewing its song in the same manner. If this is not the communication of pleasure, where is that to be found ?

But I must end. On this subject, as on that of Beauty, I have attempted to prove the direct and intended Beneficence of the Creator in the same manner: and what that is, I need not repeat. I have argued from the contrivance and the effect; from the final cause, up to the First Cause. This may not be "Philosophy;" as it is not Science. But when Philosophy shall show that it can explain everything without the aid of the Creator, and whenever Science shall prove that it is acquainted with all the secondary causes, I shall gladly avail myself of those further lights: but it will be for the purpose of showing, more clearly, His wisdom; as my conviction of His beneficence will remain unchanged.

CHAPTER XLIX.

ON SENSIBILITY. INSENSIBILITY TO PAIN, IN THE LOWER ANIMALS. QUESTION OF PAIN. SYSTEM OF PREY.

IF I have sought for new instances by which to illustrate the attributes of God, and have proportionally rescinded many examples adduced by my predecessor, it is, partly that I might increase the range of proofs, and partly, in the hope of adding new attractions to a somewhat exhausted subject. Hence I am induced to point out what I trust I shall also prove to be a most extensive instance of the beneficence of the Deity, in the comparative degrees of sensibility in animals, particularly as concerns the sense of pain. But as this view is new to physiology, and the facts in proof of it as yet scanty, it may not, possibly, be willingly received; though I have no doubt that it will be confirmed, when the cultivators of natural history shall turn more attention to what they have too much neglected, in pursuing the grammar of their science. This, however, is but a part of the present object. The nature and limitations of sensibility in general form a question deeply implicating the goodness of the Deity; as the subject just named constitutes but one portion of the whole: and as the often discussed question of Pain, as an appointment, or a permission, is only a branch of the

same inquiry, I am naturally led to examine the whole, including under it the system of prey.

I must not, however, proceed, without stating an objection which may easily be made by persons of other views than my own. Although extensive good consequences do result from the arrangements to be here reviewed, those may not have constituted the primary intention. Such variations in the sensibilities of the different parts of an animal, of the constitutions of different animals, may be a necessity arising from other established laws, or dependent on their very nature: or, a comparative insensibility to pain, in a particular animal, may be an implicated result of some modification of the nervous system, demanded for other purposes; while also, it might have been necessary, in man, that the great powers, mental and otherwise, attached to his system, should have required that nature or structure of the sentient organization, which is most exposed to suffer pain. I think that the following remarks will furnish a full answer to this objection, even on physical grounds: while it will be supported by that general moral conclusion respecting the designed beneficence of the Deity, of which I have produced such ample demonstrations from other sources. But though a good end were obtained but collaterally, we are not precluded from considering it as an example of the care of God for His creation; especially, having so often seen that more than one end is often obtained through a single arrangement of contrivance.

To commence from the general subject of sensibility, the 31st chapter has already explained, that there are impressions on nerves, which excite actions in the body, but which are not felt by the animal; or, that there are sensations (we have no other word) without con-

sciousness, as well as sensations, in the usual meaning, with consciousness. This conclusion was also then drawn, among others ; that the consciousness of impressions on the nerves, as of the action of muscles, being sensation, in the ordinary acceptation of that word, had been denied wherever it would have been inconvenient or useless.

But the purpose of the present chapter requires that this view should be extended considerably further ; since it forms the main object, and is also the basis of the partial arrangement in question as to the inferior animals. If I formerly showed that the now unfelt impressions would have produced much inconvenience, had the animal been conscious of them, so would many have been productive of pain, for reasons which I reserved to this place. And if consciousness has been denied to these, while it has been granted to other impressions, or other nerves, from which, under certain circumstances, pain does arise, then is it not an unreasonable *a priori* inference, that the intention of the Creator was to avoid inflicting pain, generally, and that when it does occur, it is useful, or is a provision for some good purpose, or else is a necessity implicated in some other appointment : as it may also be, to a certain degree, an intended evil, for ends relating to the moral government of the world. In this latter case, it will, in a physical view, be purely pernicious : and this question I must therefore separate for the present, as belonging to a different class of considerations.

But, viewing now the physical question only, I must partly repeat from the chapter just named, and partly add, that if the appointment of a class of sensations incapable of exciting pain, is a remarkable act of beneficence in the Creator, so it is one of His most un-

fathomable mysteries: since this separation occurs in many organs endowed with high powers of sensation, as they are also amply provided with nerves; and even in organs, many of the impressions on which are attended by consciousness. This is the case with the organs of sense: and, under a mystery not less incomprehensible, it has been ordered that certain parts shall feel some injuries, and not others, or that there shall be sensation with consciousness, implying pain, to one species of stimulus, and not to another; as, in these cases also, we can generally trace the useful purposes of the distinction. Or, these organs, or parts, feel accurately or acutely what was necessary for the well-being of the animal, while they do not feel what would fruitlessly pain or injure it: as it thus becomes a conscious being as far as its sensations are useful, remaining an unconscious one as to those whence it could derive no advantage, and might experience gratuitous suffering.

To recall a few facts in illustration, it is certain that the heart and the blood-vessels must be highly sensible organs; not merely because they are largely provided with nerves, since, in the manner that I have already distinguished the different powers and offices of nerves, this proves nothing, but because, without such sensibility, they could not perform their numerous functions. We are further assured of a high degree of sensibility, of some kind, in the heart, from the effect which mental emotions produce on it; as we equally are respecting many of the secretory vessels, whose actions are excited in the same manner, and in others; while the same must be true of the general system of vessels, from the peculiar and various effects produced on them by different chemical stimuli. But if this sensibility was

the same as that of the skin, or were there sensations with consciousness, it is plain that the effects must have been painful, and sometimes, possibly, even to death.

I need not extend these proofs, though it would be easy to do so much more widely. But it is equally true of the muscular actions, forming a similar mass of facts, which, if also formerly noticed, require to be stated more particularly here. The action of the heart is sudden and violent, as it is incessant. In any other muscle, such action would produce the pain of cramp; as would probably also that of the sphincter muscle, did it occur in any others; an inference further justified by the fact, that in both these instances, an excess of the appointed action does produce painful or disagreeable sensations; as in cases of disease which I need not quote. And it is a parallel fact, that in the voluntary muscles, no natural action, nor even an excess of that, is attended by sensation, in the proper sense of that word, while the power of producing a conscious sensation, or pain, still exists, as in the instance of cramp just noticed.

It will perhaps be said, that there is nothing in this worthy of admiration, any more than in all the other appointments of the Creator for gaining certain ends; since He who designed the end must have appointed the means. And I am bound especially to notice this remark, because I have sometimes made use of it where I thought my predecessors had misplaced their admiration, and were merely stating an identical proposition. But the subject of admiration here, consists in the apparent difficulty, or in the mystery. The general one I have often already pointed out: but the additional one in this instance is, that the highly important difference between conscious and unconscious sensation, or be-

tween insensibility and pain, should have been so nicely marked in the same organs, and, apparently, in the very same nerves. Nothing can more indicate an arbitrary appointment for a specific purpose than this; while executed by means which we cannot comprehend, or even conjecture: the mysterious fact being, that certain degrees of action should be allotted, and often also under specific modes, to individual muscles, unattended by consciousness, or contingent pain, while, this point of permission being once passed, the consciousness should commence. And the final cause will here also be found to justify the arbitrary law: or it is one of the numerous instances of useful pain, if among the more abstruse. The limits of the natural and useful actions, to be unattended by consciousness, were to be defined by the natural stimuli, or the usual order of impressions, appointed for the conducting of animal action and life. It was also an apparently necessary consequence, that excess of stimulus, or unnatural impressions, should produce actions in excess, while the extension of those beyond a certain degree must have been serious injury or destruction. The consciousness, or the pain, then becomes the warning to the will; and the animal seeks the remedy in some manner, through its intelligence and exertion.

It would be almost to repeat the same reasonings, were I thus to proceed more widely through the animal structure. The stomach and its dependencies, the lungs with theirs, and far more, offer analogous facts. All feel, and act but through feeling: yet their actions, like their feelings, are unknown to us, until there occurs some impression threatening danger or destruction, when the consciousness is brought into action, under the form of pain or inconvenience, so as to call in

the will as an aid to the involuntary powers. Yet, as I formerly showed, the remedy is provided, in some cases, without the aid of the will, or through involuntary motions. I need only call to mind the facts respecting the larynx and the eye; but the essential circumstance is, that in such cases a special beneficence has been exerted, in preventing unnecessary consciousness, or pain, and also in causing to be performed automatically, what the will could not have well executed. The stimulus to the larynx which excites coughing, can scarcely be called painful; yet it is as effectual a remedy as if extreme pain had preceded; as it does in the skin, when injured. In sneezing, the irritation which excites the involuntary actions of so many muscles, is often pleasing, rather than painful, while it is as effectually remedial; and in the winking of the eye, the sensation at the roots of the eyelashes which is its frequent cause is scarcely felt. These few facts, even without others, should prove that pain was not a general intention on the part of the Creator, while it is also a remedial process, but that much contrivance has been exerted to save or avoid it, by effecting without its aid, in some cases, what it performs in others, and in a manner not less mysterious than that under which the vital functions are carried on.

Thus am I led to consider the much more remarkable insensibility of highly sensible organs or parts; a contrariety of terms which I use from choice, that the fact may produce the stronger impression, under the high reference which constitutes the present object. It was an act of beneficence to have so regulated sensibilities and sensations that they should perform their duties with the least pain; it was that of wisdom, that they should execute those well, or perfectly; and for this

purpose do the sensibilities of different parts differ, not only in degree, but in kind also. The sensations of the body are not, as they are commonly supposed, confined to the merely pleasurable and painful; nor are the provided organs of sensation, the nerves, limited to feel, simply, in a greater or a less degree. Their sensations, like their sensibilities, are specific, and not less various: and this, not only in the case of the senses, but almost everywhere else: while in almost all, the special utility of this can be discovered, as I shall proceed to show by a few selected instances.

Though the brain is, ultimately, the undisputed seat of all sensation, it is insensible to any mode of injury that can be inflicted on it. I know not that we can assign exactly the evils that would have arisen, had it been otherwise: but it is at least easy to see, that the sensation of consciousness, or pain, would in this case have been superfluous, and therefore a superfluous possible evil. That the fact itself is among the most mysterious of those which belong to the whole of this mysterious system, I need not say. The heart is equally insensible; or rather, we cannot feel when it suffers; highly sensible as it is to arterial blood, and discriminating as its sensation is. It may be injured in any manner, without exciting the feeling of pain: and, still more remarkably, it does not convey the sensation of local pain, when inflamed: as is the case with most parts of the body, and strikingly with the other muscular viscera. Here also, we can at least see, that in the first of those two cases, the reverse would have been unnecessary. This organ cannot be injured without such previous injury as is sufficient to excite the will to a remedy: and that guard, under voluntary effort, is what the irritation of the larynx, under involuntary action, is to the lungs.

But the other analogous facts must not be omitted ; because they are all parts of one wise and beneficent provision. The eye is especially sensible to the contact of a sand or other similar body ; yet it is almost as insensible as the heart, to the knife which can destroy it. It is evident that the eyelids were an insufficient guard against the former accidents ; and thence is there a provision of pain to excite the conscious animal to a voluntary remedy, as it also excites the involuntary lacrymal gland. Against the latter violent injuries, the will with its power was guard enough ; and more would have been the contingency of superfluous pain. And here also we find one of the cases of a special or discriminating sensibility, just noticed. The same sand would not irritate the skin, yet it not only irritates the otherwise insensible eye, but brings into remedial action, not merely certain involuntary powers, but the whole voluntary energy of the animal. And yet the same, thus irritable surface, bears the perpetual application of a fluid so strongly saline as to excoriate the neighbouring skin : while, still more remarkably, it suffers pain from the application of pure water, tasteless to the highly sensible tongue.

It is a different, yet a parallel case, to notice the insensibility of ligaments and tendons to the same class of injuries, while they are sensible to that particular kind, against which there is no guard but that feeling attended by consciousness which is a source of pain to the animal. They may be cut or burned without any perception of the injury, but there is suffering if they are overstretched ; or the consciousness is commanded to feel the one class of injury but not the other, because the skin was the sufficient guard in one of these cases, but not in the other one. A certain excess of tension

would have proved their destruction ; and the remedy has been, to attach consciousness to this excess, while it would have been a superfluous contingency of pain in the other cases.

I need not pursue this class of facts further through the animal body; especially as many of them might not be very intelligible to any but medical readers, and are otherwise inadmissible in a popular work. I may proceed to some remarks on that sensibility of the skin, to which consciousness, in ourselves very particularly, has been attached ; as that will also lead to all that remains to be said on the physiological appointments respecting this subject ; obscure as these are, and admitting, as they do, of nothing more than some distinctions more accurate than have hitherto been made on the nervous system. It is this capacity of suffering pain in the skin, which has led to the common and erroneous conclusion, that the same kind of sensibility was distributed over every part of the body ; as it is, not unnaturally, further imagined, that the most important parts possess this unhappy property in the highest degree. That the fact is not so, I have sufficiently shown : while it will be immediately seen, why the painful sensibility of the skin is beneficial, and why, possibly, it was unavoidable, as an implicated necessity dependent on its organization and uses.

I have already said, that particular organs, or nerves, were ordained to be sensible to certain impressions and not to others, that consciousness had been limited to certain feelings and actions, and that a purpose of utility was to be traced in these arrangements. There is not a sensibility to every impression, in every nerve of sensation ; and further, of those impressions, some are attended by consciousness and some not : while, in

the former case, pain is the result of excess of impression, as, in the latter, disease may often occur, with consequent pain, or other inconvenience, equally leading to remedial exertion. But the theory of pain has been stated by metaphysicians in general terms, as inaccurate or untrue as they are purposeless; the usual phraseology being, that all moderate impressions on nerves were attended with pleasure, and all immoderate ones with pain. They have been ignorant of the distinction here made, between nerves of conscious, or actual and common sensation, and nerves of unconscious sensation; as also of the peculiar nature of the nerves of the senses; while, besides this radical error, they do not appear to have seen, even in their own excerpted case, being that of the senses, that there was a special purpose to be served by the effects consequent on excess of impression. But, not to expose this ignorance and inaccuracy further, thus it must ever be, when the phraseology of metaphysics is applied under defective knowledge of the physical facts on which they assume to reason; while it is fully true that this science should apply rigid knowledge to ascertained facts, and thus become what it has so rarely been—the science to combine and deduce, to construct knowledge out of the blind labours of those who can neither reason nor generalize, who can see, but cannot infer, who torture nature, yet, after all this torture extract nothing. But if the much plainer science of number and quantity has been darkened by this too often intermeddling art of words, physiology has no especial reason for complaint. To return:—

In man, at least, the skin is the most extensive organ of conscious sensibility; being that portion of the body which feels most extensively and acutely, and

is therefore capable of suffering most pain, independently of diseased actions or changes. And it is the same, generally, in other animals of a similar structure, under modifications and exceptions which I shall point out hereafter. Under the question of utility, or that of the final cause, the purpose of this is apparent. If the larynx is the sentry to the lungs, the skin is the general guard against universal injury from external ordinary causes, or against such excess of stimulus, of many kinds, as might lead to irreparable mischief, or death, defeating the very purposes of the Creator in the fabrication of the animal. This is a great end; and thus is the wisdom of the appointment obvious; as I shall hereafter show the expediency, even of that excess of sensibility, producing extraordinary pain, which, upon a superficial view, appears to be a superfluity productive of pure evil. And it is especially an act of beneficence united to wisdom, that the guard should have been placed here; and that the possible feeling of pain should not also have been allotted to those other parts to which this was the sufficient one; since this would have been a provision for the contingency of superfluous pain. The skin performs all that was needful; and thus is it the especially sensible portion of the body, and the great seat of pain from injury.

It remains to ask, under physiological views, whether this capacity to suffer pain is not a necessity, depending on the appointment which made the skin the seat of useful and pleasurable sensations. Under our limited knowledge of the nervous system, we cannot say that it is not so; and in this specific case, the metaphysical assertion, just censured as being too general, will be correct. But as the reasonings belonging to

this question are implicated with the facts belonging to the other senses, I must now turn to that inquiry which the carelessness or confusion that abounds, both in metaphysical and physiological writings, on the nerves and their offices, renders indispensable.

What I have already remarked of the nerves at large, that there are some contrived to feel one kind of impression and not another, is known to every one respecting the nerves of the senses ; though the provision is seldom the subject of that admiration which it deserves, as the important conclusions to which this leads respecting the nature of the nervous system, seem to have been equally overlooked or forgotten. Because, in the ear and the eye, there are special provisions for collecting, in the one case, light, and, in the other, those unintelligible movements in matter which produce sound, we are apt to forget that it is the nerve alone, in each case, which is sentient to the particular impression ; or it is empowered to convey to the nervous centre, that one feeling for which it has been ordained, as it is unable to convey any other. This important fact is perhaps most striking in the organs of smell and taste ; where the sentient, or conducting nerve is touched, in one case by a ponderable and assignable substance, and, in the other by that which chemistry knows to be, equally, matter, though it cannot be weighed. The tongue tastes, and the olfactory organ smells, respectively, those two classes of matter : nor are their powers any more interchangeable than those of the ear and the eye ; though popular error confounds them, by mistaking flavour for taste, or confusing those terms, so as to consider them as one sensation ; when the fact is, that flavour is odour, though referred to the mouth, and is truly felt by the nerves of smelling, as I observed on

a former occasion : a fact explanatory of much on which I cannot here enter.

Here then are four specific kinds of nerves, and each performing a duty as special, to which also it is rigidly limited. There are nerves of conscious sensation, because such was their purpose : but their powers and limitations of feeling are as marked as those of the nerves of unconscious sensation, which distinguish arterial blood in the heart and the arteries, raw and sodden grass in the œsophagus of an ox, chyle in the lacteals, and so forth. And while the one set of facts confirms the other, and, with that, the general view already stated, so in opening a very different picture of the nervous system from that which is currently and carelessly received, do they increase our admiration of this mysterious and wonderful organization. Let me therefore repeat, that the sentient nerves are not the indiscriminate conductors of every kind of feeling to the brain, but that there are nerves appointed to feel, separately, every individual or peculiar impression, or substance, which can concern the animal, or, of which the knowledge is necessary for its good. It might be said indeed, as it has currently and carelessly been, that it is the brain which feels and discriminates in all these cases, as it unquestionably acts, with thought, if it be a conscious sensation, without it, if the sensation be of those unknown or unfelt ones which conduct the animal machinery. Yet this does not explain the facts. The Sensorium knows ; but it is still the nerve which must feel or distinguish : must feel the cause of sound, and not light ; or the effluvia of a rose, and not the difference between salt and sugar. And in the other set of cases, it is equally the nerve which must feel that venous and arterial blood are different things, that

the tears differ from water, and that chyle and vinegar are not the same substances. Neither set of these nerves indeed feels with knowledge, since this lies in the mind : but they are the organs of discrimination in some sense, as they are the organs immediately impressed ; acting a part as to the brain, analogous to that which this great centre of all the nerves must be conceived to perform for the mind, or for the purely metaphysical entity.

If I formerly showed, that as there were demonstrable nerves appointed for muscular motion, and others for sensation, so the latter must differ in their natures, what I have thus described includes with some recapitulation a further number of facts in evidence. Whether anatomy may ever discover visible differences in these, it is impossible to foresee ; but it has hitherto found such insuperable difficulties in this part of the animal machinery, that its failure would be of no moment in a negative view. On its hypotheses respecting some portions of this subject, I shall say nothing, since I cannot discover their value. But the conclusion ever recurs, that the nervous system is a far more complex and wonderful piece of machinery than it has hitherto been esteemed, and that it far more strikingly therefore exemplifies the power and the resources of the Creator, than has been supposed ; much as it has ever claimed the admiration and defied the investigations of philosophy.

Having said all for which I can afford space, on the question of distinction in the nerves of the senses, I may return to the skin, which, as the organ of touch, is the only sense that I have left unexamined, as it is that one which is especially concerned in the question of pain. It is not easy, however, to define or limit the

meaning of the term touch, when used as the expression for a sense ; general, and various, and vague, as are the impressions which it conveys, when compared to the definite and exclusive feelings conveyed by the other senses.

The simplest, however, is that of temperature ; the discrimination of which seems to lie in nerves appointed to this peculiar office, wherever these may be situated ; while, that the skin, or surface, is at least their most extensive seat, is not disputed. And it is a proof of there being separate nerves established for this purpose, susceptible of this particular impression, and possibly not of any other, that there are many parts of the skin which are highly sensible to contact under different modes, and which are, yet, little affected by differences of temperature, unless those are very great. The more striking cases I must not quote in a work of this nature ; but every one knows that the inside of the mouth is less sensible to heat than the outer skin, and that even the inner part of the lips can bear a much greater heat than the outside. Thus is it probable that the skin contains two organs of sense rather than one ; a feeling for temperature, and a feeling for the contact of resisting substances ; since we further find that the powers of discrimination for the latter class of impressions differ exceedingly in different parts, while, as I have just said, it has no necessary connexion with the sense of temperature. This is the case with ourselves, in comparing the fingers and the lips with almost any other part of the skin, as it is also especially remarkable in the bills and feet of Ducks, Woodcocks, and other birds, in the cirrhi and probably the ends of the fins in fishes, in the tails of Monkeys and other prehensile-tailed animals, where it is proved by the

thinness of their skins and papillæ, and, not further to extend these illustrations, in the prolonged noses of the Tapir, Elephant, Hog, Mole, and many other animals: while, in all such cases, we find a greater number or bulk of nerves, which we must believe to be appointed to this sole office, since the parts in question show little sensibility to temperature, and far less than other parts less liberally provided with nerves. The facts also which I have noticed respecting the cutting and burning of tendons and ligaments, serve further to prove, that neither the sensation of temperature nor that of resistance is necessary to a nerve, since these parts contain nerves, but that there are nerves constructed for those peculiar offices. This indeed, as far as temperature is concerned, is easily proved of all deep-seated parts, if less easily in the case of mechanical injury, from the difficulty of thus affecting such a part of the body without at the same time interfering with some nerve conducting the sensation of touch. The skin thus suffers severely from extremes of heat or cold, but a naked tendon or muscle does not: and thus, when the sensibility of the former has been destroyed by a low temperature, the whole limb or body may be frozen to death, without a perception of pain. The appointed sentry has been killed; and that which it was placed to guard becomes the victim.

Having thus discriminated in what has been called the fifth sense, as far as I can here venture, I may return to the question, whether it was possible that the sense of pain could have been separated from the nerves of touch, either under the case of temperature or that of contact, except under a contradiction; and whether pain must not therefore be considered as a

necessity, in both these cases, as, in both, its utility is apparent. And if I shall further prove, that the nerves of the other senses are not so susceptible of pain from injury as those of touch, it will not only furnish another demonstration of the distinctions in nerves, but of the beneficence of the Creator in limiting the contingency of pain in these cases, as He has done in so many others.

Every nerve belonging to a sense is exposed to suffer pain from the excess of that impression which constitutes its peculiar function ; while there are some varieties in the effects, where peculiar powers of discrimination are exerted. Thus the optic nerve suffers from excess of light, as that of the ear does from excess of sound ; while the former feels pain also from peculiar colours, and the latter from peculiar qualities of sound. The case is similar for the nerves of smelling and tasting ; as is even more familiar. Now, these are perfect analogies to the case of the skin, or the nerves of touch ; where pain, whether from contact or temperature, is the result of excessive impression as to the peculiar functions of those nerves. It is evident therefore that in no one case could the possibility of pain have been separated from the powers of sense, without a species of miracle, since it is the natural consequence of their functions ; and thus is the extensive possibility of pain in the skin, the great seat of all pain, which is not that of disease, as necessary a result of the extended nature of this sense, as the local suffering from excess of light is a contingency dependent on the functions of the optic nerve. Yet with this necessity has been combined that utility which I have already pointed out : and as, in this, we trace the wisdom of the Creator, so do we see that it would have been unwise, and not beneficent, to have inter-

posed by means of that interference which I have just called a miraculous one.

If this may appear, to my peculiar readers, a mere physiological inquiry in which they have no concern, the case is far otherwise. It will now be more clearly seen, how metaphysicians have erred in concluding that all excess of impression, without regard to its nature or to that of the nerves, was pain, and in what manner their definition ought to be extended and limited. But it is of much more consequence as it bears on the great question of beneficence here under consideration. On any nerve, impression must be a cause of action : action is fatigue, as animals are constituted ; and fatigue, producing exhaustion, may, at some point, become absolute ; becoming destruction, or ending in palsy, or death. Hence then is it appointed for every such nerve as those under consideration, that pain shall precede danger, or be the warning of the tendency to destruction. In the nerves of touch, that pain is wisely caused by excesses of contact and temperature ; and such therefore are the sources of common healthy pain, being that of the skin chiefly, and of other parts, probably, only because the nerves of touch have been injured. But as the injurious excess for each quality of a nerve of sense must consist equally in an undue demand on its peculiar sensations or exertions, so has it, with equal wisdom, been ordered, that what each feels shall be, to it, the peculiar source of pain ; as, to each, that pain becomes the warning against its own particular danger. And the beneficence would be proved to be as perfect as the wisdom, if we were sure that the nerves of the four finer senses did not suffer from those excesses of impression which offend the nerves of touch, as seems to be true of the

unconscious nerves of the body; abstracting of course all disordered conditions, as the reader must remember to do throughout the whole of this inquiry. But if this is probable, the proof is difficult; since it is not easy, in the first place, to get access to one of those nerves without injuring a nerve of touch; while we are also not sure that a nerve of touch may not be united to one of another sense, in the same branch, as appears to be the case with respect to nerves of motion. But it is at least certain, that the cutting through the optic nerve is attended by no pain compared to that which occurs from the same cause in far smaller nerves of touch, as surgery well knows: while the general probability of this conclusion is confirmed by other facts, on which I cannot properly enlarge in this place.

Thus have I stated, as far as I could here venture, the essential facts relating to sensation and sensibility in animals, which concern the attribute of the Deity under review, and also cleared the way for understanding what I hope to establish, namely, that further act of beneficence as well as of wisdom, through which the sensibilities of animals inferior to man in different modes and degrees, have been regulated, so as to permit them to perform their functions and enjoy their lives, with the least superfluous pain, or contingency of pain.

He who, with what has now been said, recollects also the chapters on muscular motions (c. 30 and 31), will not, I trust, be startled, when I begin with this fundamental proposition, namely, that we can conceive, physically, a living and moving animal, without senses, or without sensation, produced upwards from its germ, proceeding thus through its whole existence, and thence passing a life without pain or the possibility of it. I have formerly shown that all the vital impressions and

actions are unfelt: and therefore this supposed animal could proceed without consciousness or feeling. But as this would be to defeat the very object in view in the creation of animals, such a case, however physically possible, is not morally conceivable. They however who believe that plants are without sensation or consciousness, as I trust hereafter to show that they are not, can find no difficulty in believing in such an animal: that it might exist at least, if it does not. It is still more easy to believe in an animal slightly elevated above this, or possessing some kind of sensation and consciousness; as, if such a one is known, it would be the lowest in the scale of animal existence. And that which is thus stated as a possibility, seems to be nearly a fact. The Hydra appears to be sensible to one chief impression, and that on a stomach; as it is, in reality, but little more. Excepting its tentacula for the present, it can therefore be conscious but of that one, obscure, yet pleasurable sensation which is felt from the presence or digestion of food: while this want must be its sufficient inducement to voluntary action; and this limited consciousness its only happiness, and the end of its existence, or creation. And such, more widely, if under modifications, is the probable constitution of an immense multitude of the lower animals; while in those, under the same exception, there can be no intelligible pain, but the pain of hunger, such as that is.

Further, if we rise a step higher, and suppose an animal possessed but of one sense, and it may be that of taste, or smell, as the most probable, I have already shown that this could be a source of pain but from its own class of impressions: though it might still be a fertile source of pleasure, as we know from our own experience. Or if, proceeding still upwards, we grant

all the four higher senses, excluding that of touch only, we can easily conceive an animal possessed of these, or any of them, in great perfection, and also deriving great pleasure from them, with very little contingent pain : since its contingencies as to those are very limited, when compared to those which belong to the sense of touch. And thus therefore may there be conceived an active, a happy, and even a considerably intelligent animal, theoretically subjected but to a small contingency of pain, and practically exempted from it, or suffering but rarely.

That, however, cannot be true to this full extent, unless there can be an animal of such powers, entirely deprived of the nerves or sensations of touch ; because the consciousness of external contact, and of temperature also in many cases, is necessary to the performance of many indispensable functions. Even the tentacula of a Polype or a Medusa must be organs of touch, else could it not recognise its food : or, though voluntary motions might be performed by the extreme animal already speculated on, and without contingency of suffering, as all the vital actions proceed without sensation, it could not will an end but through a previous sensation ; including therefore the possibility of pain through the organ of that indispensable sense. This is the exception to be made in the instance of the hydra ; just quoted, as an illustration only, because it was the nearest to be procured : and thus, even in these extreme animals, must we believe that pain can be suffered through the tentacula.

But if it would be easy, pursuing the same speculative views of a possible animal, to conceive the nerves of touch to be granted in limited quantity or with limited sensibility, so as to admit of all needful utility,

and exclude much contingency of pain, the very fact is before us, in this case, and in many more. Hence such animals should be, theoretically, little subject to pain, though competent to all their functions, because there is but a small and peculiar organ provided with the nerves of touch, as there are no other organs of sensation: while it by no means follows, as I have already said, that those of higher organizations are deprived of pleasure in the same proportion. And though it is admitted that pain is a necessary consequence of sensation, and also a useful warning, it does not follow that the pain of the organs of feeling in the lower animals shall equal that of the skin in man; while we have reason to think it is far less, partly because we know that a very little would answer all the useful purposes, and partly because of the general inferiority of their whole nervous systems.

The provision for the reproduction of the organs of feeling leads also to the same conclusion; in the tentaculated Medusæ, there is an organ, or root, whence new ones are perpetually shooting, as the former are lost through injury. An animal of fine sensations would defend its important organs more carefully, under the warning of pain: this peculiar provision is the probable substitute; and hence it is probable also, that the lower classes of animals, having organs of touch, suffer no pain, even through those: in which case, their life must be one of unalloyed pleasure, such as that may be.

In concluding, I need scarcely insist on the metaphysical admission, that the animal which feels pleasure only, be that what it may, while knowing of no other, is perfectly happy; as it must thence follow that the happiness of the inferior animals is very great, and

their proportion of grievance very small. If this is a further view of the beneficence of the Deity, it is one on which I do not intend here to dwell, since it would lead me into that intricate inquiry which relates to the comparative happiness of man, the most obviously suffering animal of all creation. Yet we may suppose that the inferior allotment of pain to the lower animals is a compensation to them for deficiency of pleasures, in which case a general balance of good is preserved through Creation.

Having terminated this general reasoning as to the susceptibility and existence of pain in the inferior animals, I may proceed to state the facts in evidence; while I believe that they are sufficient to establish this view, if less numerous than they would have been, had physiologists ever reflected on the subject which I have now brought before them.

If we commence with the lowest animals, such as the *Hydra*, proceeding to the *Actinia* and many more of the analogous tribes, and subsequently to the *Medusæ* and others of similar general structure, or if we examine the *Vibrios* and others among the minuter races of creation, we find that their bodies admit of injuries of any nature, without showing marks of avoidance or of dislike, which, where there is the power of moving, or of retracting, would assuredly be the case. Many also admit of losing large portions of the body, or limbs, where those exist, without any apparent sense of the loss; since they continue to carry on their usual functions as if nothing had happened. Not to quote the less known cases, thus does the leech continue to feed after losing the lower part of its body, as if it were entire and uninjured; and thus does the earthworm admit

of mutilation, without destruction, or, probably, suffering; since its contortions, being only its unavailing natural exertions, prove nothing, either in this case or in its position on a fish-hook. The probable absence of pain in such animals, lower down at least, under mutilation, is more strongly evinced by the fact, that some, like the *Hydra*, are to be propagated in this manner, and that others reproduce the lost parts. It is a parallel case to that of plants; in which we cannot believe that pain is felt from such injuries. None of these results, and many more yet to be named, could happen, did these animals feel and suffer as we ourselves do: and while we have no other ground of judgment than their conduct, so is this a safe one.

If we ascend a degree higher in the scale, we arrive at the same conclusion; though, as the organization becomes more operose, the degree in which pain follows injury may also augment. But in the tribe here alluded to, including the insects and the crustacea, the whole body is so enveloped in a hard and insensible covering, that no sense of general touch can exist, though there is probably a sufficient sense of contact, through vibration, for all useful ends. And though I need not make a separate division for this purpose, the same must be true of all the shelly mollusca, and of many other marine animals which I need not particularize. This is a complete proof, from the mechanism, or anatomy, that none of these animals can suffer through that seat of pain which, in us, is the chief one. And as it seems sufficiently proved that the deep-seated organs are little or not at all susceptible of suffering, even in the higher orders of animals, then can there be no mode of pain for the multitudinous tribes in question, except through those special organs, palpi, antennæ,

or whatever else, to which the sense of touch has been confined. In all these cases also, as in the tentaculated animals formerly noticed, the range and possibility of suffering must be, at least, very limited : as, similarly, it is not necessary that great pain should ever occur, for the reasons then stated.

But as neither reasonings nor facts are very powerful against prejudices, while the prejudices on this subject are also sufficiently natural, I must note some examples of serious injuries in such animals, where no demonstrations of pain follow. Yet not without previously reminding the reader of the insensibility of the important organs in even ourselves, as well as of the interior parts generally ; while surgery well knows that even the cutting of a muscle is little painful, as that pain too, probably arises from the section of nerves leading to the skin, and therefore nerves of touch.

The tribe of Crabs possess the power of throwing off their legs, as I formerly described. This appears to us a serious injury ; yet it is voluntarily incurred, and often on very slight grounds ; since the younger animals will often throw off the large claws, when closely pursued by the finger ; under the apparent intention of lightening their weight in flight. Pain would not be sought, for so slight a cause : but the examination of the parts, as formerly noticed, suffices to prove that there is none. The conduct of insects which have undergone the usual operations of naturalists, in being impaled, or even embowelled, is a still more remarkable proof of the absence of suffering. If the impaled insect escapes, it is unconcerned, and acts as it did before ; and the Beetles will walk just as they did, after all their viscera have been removed. Most of this tribe,

and many others, continue to walk without the head ; as the *Tipulæ*, and others, fly, under no apparent inconvenience, though they have lost the half of their legs. They struggle themselves loose from the pins of the naturalists and devour each other ; and those naturalists also know, that they do even more than this ; which, under the feeling of pain, would be impossible. Nay, the head of the wasp will bite, and the abdomen sting after these parts are separated : as the spiders and beetles which counterfeit death may be pierced by pins, torn to pieces, or roasted, without showing any signs of motion. Nothing of all this is conceivable under the feeling of pain, because we know, at least, that it occupies the attention : while those actions which imply the search and the enjoyment of pleasure, are particularly incompatible with its presence. If I always refer to ourselves, it is, that our reasonings, or prejudices, respecting pain, are derived from our own sensations, and that this is, in reality, the very question before us : and we well know that far less injuries than those which I have named, such as the prick of a pin or the bite of a gnat, are sufficient to divert the attention from the highest pleasures of sense, or to extinguish those entirely.

If further proofs are wanted in these tribes, they may be found in the larvæ of insects. *Ichneumons* lay their eggs in the bodies of living caterpillars : the egg is hatched, the parasitic larva grows, and, finally, when the invaded animal should produce its usual butterfly, it gives issue to the fly of the ichneumon. The bearing of this will be more striking, if we should suppose that an ox could thus carry about a wolf, forcibly introduced under its skin, in embryo, nourish it to maturity by the loss of its own substance through the teeth of the animal, and,

then only, die to give it birth. There can be no pain, even in this violent case; else the invaded animal could not continue to feed, and finally compose itself to spin and sleep.

If I formerly noticed, for another purpose, that there are insects which reside in the boiling springs of Italy, that fact is important with respect to the present question also. It proves the absence of nerves of touch, as far at least as those are appointed to distinguish temperature; and thus we may the more easily conceive that insects are, generally, unprovided with that modification of nerves which is most susceptible of the impressions of pain. And if the beetles in question have palpi, or feelers, which I do not happen to know, but which can scarcely fail to be the case, then may it also be true of animals with feelers, generally, that although these are fitted for their particular duties by means of nerves of sensation, they are not, or not necessarily, the sources of pain also: as I formerly suggested. That naturalists will now make experiments, to confirm, or not, these and the other facts, I cannot doubt: they would have made them long since, had they thus reasoned, and I should then have possessed much more decisive evidence.

If I now proceed still further upwards in the scale of animals, the great tribe of fishes admits of similar *a priori* reasoning, and furnishes the same kind of evidence. The skin cannot be an organ of touch in the scaly kinds, and they thus claim a similar exemption from the great source of pain; while the addition of distinct organs of touch to so many, in the shape of feelers, often of a very singular nature, assures us that this is the fact. Where there are even naked skins, I might reason similarly, from analogy, and suppose an

equal insensibility : but this, and more, demand experiment and observation that will one day be made.

As far as experience goes, the few facts yet known confirm the reasoning. Where Pike and Perch reside together, the latter are often seen with large portions of their backs bitten out ; yet they seem as active, and are as greedy after the bait, as their companions. This would not be the case with a man under similar injury, nor, probably, with a horse. They are indeed sometimes supposed to suffer ; but this is the mistake of united prejudice and defect of reasoning. If they flounder and struggle, it is because an organ of motion, one of the fins or the tail, is mutilated : those are but the failures of the usual attempts to move ; and thus the efforts of the fish on the hook are no more proofs of pain, than the contortions of the worm in the same case. And if they die on the hook, this is not the proof of pain or painful injury, but the effect of excessive fatigue, in an animal, the distribution of whose arteries partly, but chiefly, it is probable, the small quantity of oxygen which it respires, render incapable of violent and also durable exertion. Nor must we too confidently attribute the contortions of the Eel under an apparently cruel process, and as far as the operator is concerned, a truly cruel one, to pain, any more than the movements of the decapitated Turtle. If these are not always the habitual efforts to locomotion, or attempts to escape from some annoyance, physiology knows that the contractions of muscles, proceeding from what they have idly called irritability, but which are produced from a portion of nervous power remaining in the nerves, are neither the causes nor the proofs of pain ; excitable as they are, not only in the dead and unconscious animal, but in the limb which has been separated

from the seat of consciousness. If I could produce other proofs from fishes, I need not, since they are similar; while it is but to record cruelties of which it is painful to read, even though this reasoning should convince a reader that there is none of the imagined suffering.

If I take all the remaining animals up to man, indiscriminately, without regard to their differences of nervous system, or to the temperature of the blood in some, I must again commence with similar remarks on the skin; since the reader must not be allowed to forget what is so easily forgotten under the prejudice which connects pain with every kind of mutilation or injury, even with the sight of blood; and also under the very natural one of attributing to all animals the feelings experienced by ourselves. If the skin is such as not to admit of the sense of touch at all, or not in such a degree as it exists in our own, we cannot discover the use of adequate nerves in either case; as, in the first there should be none, more than in Crabs. This would be a simple superfluity at least: and I think that even this does not occur in Creation; while it would be a purely evil one, if contingent pain were to follow where there was no consistent good. If also the sense which suffers pain is a defence, and not merely a needless sense, the superfluity would be still more unreasonable, when the defence is attained without it. And thus is it attained in the Tortoises, the Armadillos, the Pangolins, the Porcupines, the Lizards, the Serpents, and more; as, even in the Elephant and the Rhinoceros, a general sense of touch is equally wanting. And higher up than the former animals, as in birds, it is at least as useless as in fishes: while if we proceed through the

hairy quadrupeds, we find no case where it ought to be such as it is in man. Even in the highly irritable skin of a Horse, it is probable that the bite of a fly excites the subcutaneous muscle, more through an unconscious than a painful feeling, as happens in the winking of the eyelid; though I must except the case of the highly poisonous flies.

Having premised these needful remarks, I must nevertheless admit, that the sensibility to pain ought to increase among the warm-blooded animals, from the greater approximation which everything in their organization makes to our own. And if it does this, it will become still more difficult to convince the mass of mankind, that they suffer less from their sensibility than we do, or are comparatively exempt from pain; since, to this, and to the steady general prejudice, there is added the further one arising from a somewhat nearer resemblance, and a much more general association with them. Yet, such facts as I can discover, I shall now produce, leaving it to further experience to decide, when the present views shall no longer excite repugnance by their novelty.

It is familiar that Rats will gnaw off their tails, and their legs also, to escape from a trap; as is true equally of Foxes. Be the pain of this situation what it may, that of the voluntary injury must be far greater, did we measure their feelings by our own. They cannot have the anticipation of death from detention, because their foresight does not extend so far: and man, even under that anticipation, could not act thus, with far better instruments than his own teeth, since his sufferings would destroy not only his resolution, but his power. And as the sole motive appears to be the

instinctive desire of liberty, we may conclude that the restraining force is not very great, or that the pain is trifling, at least. The Hyena offers a still stronger case, since it devours its own limbs, even without being urged by that degree of famine which might be supposed irresistible. Its hunger here, seems to be that simple appetite where there is rather the expectation of pleasure, than the avoidance of pain. A famished man could not eat, though an operation of this nature were performed by another, or under any violent pain; and hence, if the pleasure, or even the necessity of eating, in the Hyena, overcomes the sense of such a barbarous and severe operation, the pain must be very trifling, as a less one should be scarcely sensible. That almost any pain should be voluntarily inflicted for so trifling a pleasure, seems incredible.

If I cannot produce any other facts equally strong, it is notorious that horses are sometimes flogged in our own country, I should add, to a degree which none can know who have not counted the number and noted the severity of the lashes often inflicted, under this barbarous and ignorant practice, in a few hours. And though some mitigation is produced through the coat of the animal, the quantity of suffering would be sufficient to produce inability, or loss of strength, did the sensibility of this creature resemble that of a man; since I need not say that the effect of pain is to exhaust the muscular power. A horse gives no signs of this, nor does it often show any marks of suffering or complaint; since we must not attribute the rebellion of a high-spirited or vicious horse to pain alone. The same conclusion may be drawn from the patience of this animal under surgical operations: for though they cannot complain in the manner of others, for want of an oral voice,

every one knows that they can express pain under disease, by moaning, as in the familiar case of the inflammation of the feet. Sheep and oxen admit of the same remarks: while the screams of a hog under slaughter, or of a dog under punishment, do not offer exceptions, when the former is as noisy, under mere restraint, and when, in the latter, these outcries are confined to the baser kinds. In the hog, the noise appears to be an instinct for defence: and while dogs of high breeding do not complain under punishment, we see their liveliness and activity return as soon as it is ended.

Such is the tenor of the reasoning and of the facts, through which I desire to infer, that while man, highly susceptible of pain, as he is endowed with the highest and most extensive sensibility, is not a standard in this respect for other animals, so is the susceptibility of pain, in these, far less than our very natural prejudices have hitherto caused us to believe. Desiring further to conclude, that there is a gradation, downwards, in this susceptibility, according to some scale which may be conjectured in a general manner, but which I could not well define at present, if I wished it; while approaching to exhaustion at that limit which scarcely separates animal from vegetable life. That I intend this view as a proof of the beneficence of the Deity, I need not urge again: as I need scarcely now say, that this moral argument comes strongly in aid of what has been thus advanced; since I have too often used it to allow my readers, if at least they are such as I would willingly hope, to forget its value.

I ought not to conclude this subject, without drawing one inference consolatory to humanity. The cruel treatment of animals has been a theme for every moralist; as it is the too frequent mark of a depraved heart.

And this it will remain, even if what I have attempted to prove be true ; since evil to them is at least intended, in many cases ; as, in others, there is a pleasure in witnessing what is believed to be their suffering, which a philosophical morality has found considerable difficulty in explaining, especially as occurring in otherwise blameless characters. But since nothing is likely to diminish materially an evil which seems rooted in the human constitution, nor even education and reflection to divert one person from what are called the sports of cruelty, it will be a consolation to the humane, who suffer because they cannot remedy, to reflect that much at least of this apparent torture is not felt. Most certainly, the pang of the beetle is not equal to that of the giant : and subject as the inferior animals are to injury, wisely and beneficently has it been so ordered. And if, as I believe, the worst consequence of cruelty to animals is its effect on man himself, a conviction of the truth of those views should tend to diminish it ; since the belief that cruelty occasions the pain which it is intended to inflict, is the true source of hardness of heart.

I must now turn to the general question of pain, and chiefly as it regards man : a question of great difficulty, which has for ever been the torment of metaphysics and theology, and on which therefore I can but offer some remarks, and reasonings, which, from defect of physical knowledge, these sciences have not perceived ; as on many important points they have drawn erroneous conclusions.

If Man, of all the animals, is the most eminently subject to pain, I have already said, that it may be a compensation, in evil, to him, for his superior powers of happiness, or that it may be a designed trial of his

patience, or else a temporal punishment for delinquency. These are the usual theological solutions ; it is a jointly physiological and metaphysical one, that this is a necessity dependent on his constitution. Part of this question I was already compelled to examine : as far as it is more properly metaphysical, it demands some further remarks.

The mind is formed by means of the senses, fundamentally ; familiar question as this is in metaphysics, I need not state it more fully, either under its proofs or limitations. And if they must act in forming the mind, in proportion to their perfection, then must higher powers of sensation be subjected to greater impressions of excess ; which is pain. Therefore the Deity could not have separated good and evil under this case, or pain and pleasure, but through a contradiction, or a miracle at least. I have here stated this proposition as metaphysicians have done : it is not my own statement. On the contrary, I have shown the possibility, at least, of a very considerable separation of pain from pleasure ; as I have also shown, that the superior senses are very slenderly the sources of pain ; while it is to those that we must chiefly look for the advantages which man derives from the mere senses ; as it is in the least important one, as far as the education of his mind is concerned, that we must seek the chief susceptibility of pain. But how can metaphysicians have forgotten, that there is something beyond the mere senses which renders man what he is ? There are many animals infinitely superior to him, in one, or two, or more senses ; there are some which are superior in all but the sense of touch. But there is no animal gifted with that further power which can extract the uses from its senses which man does ; and what that is,

I need not say. Metaphysicians know where to seek the foundation and connexions of this false reasoning: I cannot afford to pursue the subject here, and may proceed.

As the great question of evil has already been examined, the chief remarks that follow relate to the necessity and the utility of pain. But if I therefore refer to that chapter for most of the general reasonings, there are some points of this nature on which I can here venture to speak more largely than I could then conveniently have done. I have already also necessarily said so much on the questions of utility and necessity, that I have only to add some remarks respecting the latter, and to state the other in a more complete form. The organ of touch, or the skin, is the only part requiring a further examination; while it will be easy to transfer the same reasonings to the other organs of sense, where those have not been sufficiently considered. And being the most extensive organ of sensation, the objects which excite this are the most numerous, the most various, and the most liable to frequent and offensive exceedings in power of impression; while they may all be classed under mechanical force and temperature.

If the general range of pleasurable temperature is familiarly known, still, the effect of any given degree in that range may be pleasurable or painful: thus presenting a common case, where pain is linked to pleasure, under a necessity for which we can discover no remedy. The skin may, for the present purpose, be considered as a source of heat, and further, in unequal quantities; while being subject also to the general laws for the equalization of temperature, its heat must vacillate. It must therefore suffer pain, as well as receive

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pleasure, from the same external temperature, because the total sum may exceed the pleasurable range. We do not perceive how this could have been avoided, without such changes in the laws of heat, or of sensation, or of both, as would have amounted to a contradiction, and therefore a nullity. At the very least, its mode of sensation should have been such as to derive pleasure from a cold of zero and the heat of boiling water ; or else the external temperature should have been limited to a very minute range, under every possible circumstance.

The case of mechanical force is not essentially very different. A given contact or impulse is appointed to produce pleasure or convey information ; and that such impulse may be pleasurable, the quality of the sensibility is fixed to meet it. But, from the constitution of the world, these impulses must vary ; and they may thus exceed, while the quantity of the sensibility remains. And this is pain ; as it could not have been otherwise, but through a perpetual miracle, altering the sensibilities in proportion to the impulses.

If this much further was necessary on the subject of pain, as contingent on a fixed range of sensibility with varying impressions, it applies equally to every nerve of sense, or of feeling under occasional, not necessary, consciousness ; and as this is the warning of dangerous injury in such cases, I am naturally led to the further remarks on the utility of pain. And it must be remembered, that the object here is, to vindicate the beneficence and wisdom of the Deity, as far as that can be done to our understandings at present : while if I fall into any error in overrating this utility, it is of little moment to an objector ; so vast a mass of pain is there, in defence of which, reasoning like this can discover nothing.

It is a hackneyed remark, that pain is the warning against danger; but there is more wisdom in the arrangement, for even excess of pain, than is obvious to those who read or those who use it. There are indeed cases where much less than actually happens would serve the purpose of warning, as I formerly remarked; pointing out cases also of sufficient warnings without pain: but there are many also, where apparently nothing less than what has been appointed would have served the needful purpose; that being, ultimately, the preservation of life. In the case of the skin, as the chief, the stimulus announcing danger ought to be great, lest the movement for avoidance should not be sufficiently rapid; for though, in many instances, a less one would suffice, it is never certain what extent of impulse may follow the incipient one. The recoil of half an inch, for example, under a very moderate pain, might suffice against the puncture of a metallic point; but were not the puncture of a lance such as to produce violent action, death might be the consequence. This general view is of wide application, but it is unnecessary to enlarge on it. It is plain that the provision ought to be such as to meet the worst cases; and it could not have been graduated, as far as we can perceive, so as to have remedied the present evil and retained its utility.

With these remarks, added to what was formerly said on the same subject, I presume that the utility and the necessity of the appointment of pain, or rather of immediate pain, from injury, will now be sufficiently elucidated. But there remains much more, and of a far more difficult nature: while if there are some cases in which we can reason in the same manner, on the grounds of utility and necessity, thus still showing, that

the provision is essentially wise and beneficent, there is also much that we can neither defend nor explain in this manner. It may however be true, that they ought not to be explicable on any physical grounds; since this might be to assume that the Creator had intended pure, or nearly pure happiness to His creation, and that the present was a world of perfection, as far as that was possible.

To the class of pains hitherto examined, the term natural, as well as healthy, may be applied, since they occur to the undisordered organization, from temporary and external causes or impressions. But the unnatural ones, occurring from derangements of the usual actions or of the original mechanism, and being the pains of disease, form a much more extensive class, as well as a far more severe one: while it is very often so difficult to assign either the necessity or the utility, that we are driven to moral reasonings; even then becoming bewildered, under our general inference of the wisdom and beneficence of the Deity.

On this subject however, if I formerly noticed the uses of morbid pain, I must here repeat, that certain pains arising from rare external injuries, from sensations of consciousness in nerves which feel nothing under their natural duties, and from chemical actions on ultimate organs, too slight and too gradual to give a primary warning of danger, are warnings of utility, exciting the will to a remedy. And the proof is perfect, in the remedies sought by many of the inferior animals in these cases, under an instinct so complete as to direct them to the exact means of cure. And man, being the especially intelligent and willing animal, may thus admit a greater variety of painful disease, without contravening this view; as he in reality does: though

enough will still remain, as to him, to tax all our means of explanation to the utmost.

For, with this, must end the only defence of pain that I know how to make, on physical grounds. And, under exception of those moral defences of evil generally, which are given in the introductory chapter to this division, everything else appears to be useless suffering, and therefore pure evil. And the mass of this physically gratuitous pain is enormous; while it is varied, under a refinement in its causes, seats, qualities, and durations, which is indescribable. I have undertaken to state the truth as it appears to a plain mind; and as it must appear to even the most pious, if to that piety there is attached conscientiousness: that respect for truth which no considerations can shake.

And it is but true to say, that the enormous and varied catalogue of disease astonishes us not more by the variety of its contrivances, than the almost incredible nature of some of those, and the inexplicable purposes of the far greater number; when, whether the general intention was punishment, or moral trial, or death, a far less number would have effected every useful end. No metaphysician or theologian has seemed willing to encounter this great difficulty, at least as a philosopher should: whether the task has been too great, or has been shunned by theological caution, or the natural fears of ignorance assuming to know. Did I dare to go through this extraordinary catalogue, I should assuredly surprise the general reader, in representing under a broad and philosophical light, what, if he may have partially heard of, he has never seen thus stated; since medical writers have very rarely indeed philosophized on their science, and never yet under any views of the present nature. But, in this

place, that would be equally improper and impracticable; while I must suffer the blank which metaphysics and theology have left, to remain an open question for any one who chooses to try his powers on it. Yet not without some remarks, for the sake of those who may wish to attempt this great moral question: since I must consider it a moral one, till it is proved that this vast catalogue of varied disease is of unavoidable physical necessity, or conducive to physical good.

But supposing this were not proved, and that the question must resolve itself into a moral one, there can be no moral ends but pain for punishment, or for trial, or for death; each of these however, being purposes of utility in the plan of the Creator. In the first two cases, under any view of the purposes of punishment, and granting also that moral reformation is wisely attempted through bodily pain, any mode of this must be equally efficient; and therefore the variety is unintelligibly superfluous. As to the latter, while the utility of death is demonstrable, a very limited number of diseases, or even one disease, would have sufficed; while we can see no necessity for pain in this case; seeing also, that it is, very often, a very peculiar evil or inconvenience, under approaching death; and, as we cannot avoid judging, in even a moral view. Nor can we escape the difficulty here, by saying that these various modes or causes of death, through disease, were necessary, as contingent on other needful arrangements; since we see that the specific provisions for it are almost as numerous and various as those for mere temporary pain, while we can also see, that many of the external causes are very special and distinct contrivances, contingent on nothing else in the necessary course of nature.

But admitting the propriety, or utility, of those appointments which constitute the widely-sweeping epidemics, and granting further, which I do that I may not protract this far from agreeable or satisfactory inquiry, that the variety of those is useful, as we can trace special uses in some of them, though by no means in all, there are here still greater difficulties, which no one has even noticed, so far from attempting to defend or explain them. It has been so contrived, that what is a partial provision for death, shall be, in a far greater number of instances, a mere cause of pain, or of disability, lasting through years, or even through a long life; thus defeating the very purposes for which the being thus suffering was created. This seems to confound all our views of utility; and even, it must here be acknowledged, with whatever repugnance, all those general conclusions respecting the united wisdom and beneficence of the Deity which are based, partly on the *à priori* views of His necessary nature, and partly on that vast mass of facts, of which a few have been detailed in this work. But still, philosophy must hope, as piety will believe, that we have discovered, in all this, but further proofs of our own ignorance. With these broad views however, I must end these notices of facts which I could not with propriety detail; though they should be sufficiently known to every reader moderately acquainted with those epidemic and contagious diseases; which, as widely disabling or tormenting, as well as extensively or partially mortal, are often the mere causes of suffering, without serving the great purpose of correcting injurious fecundity.

But if I must terminate these specific remarks, I cannot end without a few cursory observations on the general moral question as it relates to this peculiar

mode of evil ; since I could not conveniently have introduced them into the preliminary chapter to this division.

It has been very pointedly said by a theological writer whom I need not here name, that the Creator has made no provision for pain, that all the contrivances are for use or happiness, and that such pain as occurs is incidental. I do not profess, in the first place, to understand the theology of this conclusion. Did He design one portion of His works, and leave the rest to "chance;" or design good alone, and permit chance to produce all the evil ? Or, is He defeated by His own works, or by another power ? Or else, did He act without a matured design, and without perfect knowledge, and foresight, and intention. He who has proposed this theory, ought to have answered these questions ; or, at least, foreseen them : it is a very illogical theology, at the best, which permits such remarks, and he is a very careless reasoner, at least, who leaves his subject open to such mischievous ones ; affording that handle which a certain kind of unbelief is ever ready to seize on. The simple truth is this ; and such ought to be the theology. God (we cannot understand Him,) has appointed good and evil together. And He designed both, made provisions for both. But when we cannot discover the reasons, we must submit : and we must believe the reasons to be good, because we cannot but believe that He is, Himself, Good.

But the very facts are opposed to what here assumes to be founded on facts : there is want of information in the assertion. Omitting all notice of the moral world, abounding in provisions for evil, and omitting also all notice of those pointed declarations, all through Scripture, which declare it, even to provisions for pain, and

designs to produce pain, (facts which a theologian at least should not have forgotten) the provisions for pain, as well as for disease, not less than for other evil, are notorious through all the physical world. Ferocious and poisonous animals, offensive and poisonous plants, are simple and familiar examples, whatever good ends they may also serve; though, in many cases, it is impossible to conjecture what these are. And if we can name few physical pleasures not followed by some pain or repentance, why assert that the one was intended and the other was not? The diseases which pain and disable without killing, are provisions of the same nature; and, among these, though a beneficial and wise purpose is served by placing the source of fevers in the lands which produce an injurious excess of population by their peculiar fertility, it is not easy to imagine, in the widely disabling and tormenting effects of marsh miasma, and the numerous painful diseases which it produces, aught but an additional provision for pain and suffering.

I might easily extend these facts, as I trust I need not; while I might, as easily, answer the case of tooth-ache, referred to by the maintainer of this argument, in showing that it is not a mere incident, but that, in this case also, there is a special provision for contingent pain. And if I refrain from quoting the instances, there are organs, the utility of which cannot at least be very conspicuous; since it has never been discovered; while, as seats and causes of disease and pain, their influence is very great: not indeed proving that they were created for this specific purpose, yet serving to prove that there is great disease not necessarily consequent on equal utility. But I may refer to what I have already said respecting sensibility at large, and

respecting that of the inferior animals : since those remarks show, that the contingency or occurrence of pain, in man, might have been much more restricted, had it appeared right to the Creator ; while that which He has not chosen to restrict, is equivalent to an act of intention.

But this is far from all which a rational philosophy, not fearing to declare what appears to it to be truth, must oppose to the at least thoughtless hypothesis in question : not however for the sake of opposition, but that men may not mislead themselves respecting the conduct of the Deity, and thus repose in an ignorant or hypocritical acquiescence under difficulties which it is their duty to labour in surmounting, that their piety may be founded on the firm basis of knowledge and conviction. Let the pain from the sense of touch be as defensible as I have represented, we must not forget how small is the allotment of pleasure derived from this sense. Nor, for the pains, extreme as they are, which arise from disease, is there any counterpoise of pleasure in the same organs ; while the warning, if this is to be the defence, is violent beyond all necessity. And why should we doubt that there is a provision for pain, even more than for pleasure, it might almost be said, when we find that pleasure quickly palls, but pain never ? If there is anything that looks like intention, it is this ; while the design pervades every sense, and under all its degrees of sensation. The sensibility to pleasure in any given nerve, diminishes under continuity of impression ; while, to protract pain, in the nerves of touch at least, is to increase that sensibility. No physiology can explain this, when it is one of its fundamental principles that the nervous power is exhausted in proportion to the calls on it, or to the stimuli : while in

this case, the power of sensation is exhausted by a slight impression and not by a severe one. We cannot indeed decide that this is a direct intention for pain; there may be something that we do not know: but of this at least we are sure, that it is permitted, as it was foreseen; so that the moral conclusion is nearly the same.

But, lastly, though it were said, as it is, that all this was necessary; or that pain was an evil, only because we do not comprehend the whole of the Creator's design, to what purpose does this tend? Still, there is suffering: and even were the perfection of the design visible, that would not prevent pain from being tormenting, nor any evil from being felt as evil. Our actual sufferings are the point on which all here hangs: and no theological inferences can annihilate these. They can indeed teach us to submit, and they do make good men submit, but that is all. And again, this is the true theology of the question. There is no piety in saying that we believe what we do not and can not believe: and there is neither piety nor wisdom in him who attempts to defend the God of truth by fiction, or by wilful blindness, or by giving us his ignorance in explanation of what the Creator has thought proper to withhold. He has ordained that pain shall be mixed with pleasure in our lot, and it is our business to conform and submit: as, in submitting because it is His will, we form and display that virtue which becomes our moral education, and gives us a claim to His promises. To all our doubts and obscurities, this question is indeed the perpetual answer, Who art thou that reasonest with God?

Having terminated with this difficult and disagreeable question, I may proceed to the promised inquiry into

the system of prey, where I trust that I can produce proofs of the beneficence and wisdom of the Deity which have escaped former inquirers. And though this subject relates equally to the great question of the replenishment of the earth, this is the more fitting place to examine it, because it is the great application of that provision for a low sensibility to pain in the inferior animals, which has here been discussed.

That the system of prey is a design of the Creator, is proved by the peculiar utensils and powers contrived for the predatory animals, and by the coincidence of their implanted instincts and desires with those powers. And if it has sometimes been cited as incapable of adequate explanation under the attribute of His goodness, or even as an exception to that, so have reasons been assigned for its expediency, as it has also been shown that a greater total sum of happiness is the result. Those arguments have not however been always satisfactory to objectors: but the apparent evil at least will be much diminished, if I can show that the mass of suffering is far less than has hitherto been imagined, and that, among the lowest tribes in particular, being the most exposed to become the prey of others, from their multitudes, and from want of the means of defence or escape, the act of destruction and death may be absolutely unattended by pain. But I must commence by showing the advantage derived from the system of prey.

I need scarcely repeat, that the happiness of animals is the great final cause of creation; whence it is an obvious inference, that the highest attainable number of living beings must also have been a consequent intention. And there is evidence of this, in the almost marvellous replenishment of the earth, wherever the

existence of life is conceivable ; the end being also attained through a variety of form and structure, accompanied by an equal variety of powers and propensities, which enables animal life to occupy every possible portion of nature ; an object which, it is plain, could not have been attained through a more limited number of kinds.

I have also shown, that whatever may be the variety of structure, the fundamental office, or end, of all, is to eat : or, on a broad view, and considering perpetuation as only subsidiary to the same end, in future animals, the great basis of the happiness of the animal creation is laid in the act of eating ; as through this it is also ordained that the individual shall prolong its existence to the appointed term, and can do that in no other manner. The principle is simple, though it is carried into execution in a very operose manner : while it is fruitless to ask why a world was constructed on such a principle, or whether others may not rest on different foundations.

This being the design for both the happiness and the existence of animals, the greatest possible replenishment of the globe resolves itself into the greatest possible quantity of eating ; or the primary object of the Creator must be to produce the greatest possible quantity of food. If the vulgarity of these unavoidable terms interferes with the desirable dignity of such an inquiry, the well-known words of the Psalmist may be adopted to express what I would gladly have treated in very different language ; while they may also show that he had contemplated nature with the wide views of a philosopher, while referring its government to the God whom he was adoring.

If the vegetable creation contains the most funda-

mental provision of food, I may refer, for that, and more belonging to this subject, to the 41st Chapter. But did the only food consist of plants and their produce, the present replenishment could not exist. Not only the kinds of animals would be diminished, but the entire mass of life would be enormously reduced, and many portions of nature remain untenanted. This is immediately obvious as to the ocean, though we considered the fishes alone; since I have elsewhere shown why it could not have contained a sufficient vegetable creation, though possessing plants that furnish food to some. It is still more so, when we reflect on the myriads of the shell-fishes, the still more uncountable myriads of the inferior tribes, down to the coral-making animals, and, even beyond all this, the incomprehensible crowds, which in a constant series of gradation downwards, both in structure and in magnitude, at length escape our microscopes.

Here, it is plain, there is a numerical mass of individual happiness, which no possible multiplication of a few larger kinds could compensate, as such kinds could not exist in great numbers; while we can also form no conception of any mode of vegetable life capable of affording a supply of food to all of these forms. Not to multiply instances, such animals as the Medusa, consisting of little more than a stomach, could not exist thus; while millions more are in the same predicament, from the want of sufficient limbs or other organs, from their extreme minuteness, or from such a tenderness of substance as scarcely to offer resistance to anything beyond water.

We can see no other mode, then, in which the Creator could have effected His great ends, than by ordaining that one animal should be the food of

another; rendering this purpose, at the same time, secondary, or supplemental to the animal's prime rights, its own existence, and enjoyment in a greater or less degree. That this is partially done by means of animals already dead, is true: but that supply is necessarily limited, as, under the necessary laws of decomposition, it is transitory and uncertain. Yet we may pause to admire how even this unavoidable evil is counteracted, by creating larvæ in sudden crowds, to consume it even under decomposition, by giving to many birds the power to discern it from afar and to reach it while still useful, and by that very beautiful provision which renders dead fishes luminous. Still, in spite of these contrivances, much animal food would perish unused, were it only to be consumed after death: so that a further contrivance was requisite. And this, looking at the question as if there were no other end in view than the supply of food, is to preserve that in a state of usefulness, by means of life, until it can be consumed by the animal destined to feed on it.

This is the system of prey; which thus becomes indispensable, under the former views of the Creator's design, and His mode of carrying that into execution. Or, we cannot impeach a necessary part of the general design, without objecting to the whole: while to do this, is to return to the purposeless question, why was anything established as it is? I need scarcely repeat, that the term necessary, as thus applied to God, only means, that whatever design He thought fit to adopt must consist of parts, and imply consequences. It is a necessity, as I have formerly remarked, only because He ordained it: or if it is said that He is tied down to certain consequences, it is because He made a law to act in one manner, which He might have made to act

in another, and which He follows, through those consequences, which, foreknowing, He equally appointed.

If the multiplication and happiness of animals was thus that great purpose of the system of prey which obscures all others, some collateral advantages arising from it have been so much dwelt on by other writers, as if they were principal ones, that I must at least bestow a brief notice on them. It is said that the natural death of animals would be more cruel than a violent one, as implying decrepitude and starvation. We cannot lay much stress on this, knowing that thousands thus die; and, in an immense number of kinds, including many of the larger and more sensitive species, infinitely more than are destroyed by violence; at least in all those which are not domesticated for human food or other uses. And that the act of natural death is without suffering, we can see; since the animal appears to pass to sleep through a sort of stupor; again marking the beneficence of the Deity to this part of His creation.

It is another collateral use of the system of prey, that the quantity of injurious decomposing matter is thus diminished: but neither can much stress be laid on this, when it is recollect ed that almost every animal seeks instinctively some place of concealment before death, through an impulse probably appointed for this very purpose. Hence the collections of bones in caverns, which have been so much and so idly discussed. And I have but just noticed that the rapidly generated crowds of larvæ, ever multipliable to the extent of the supply of such food, offer an ample remedy against this inconvenience.

But when it is also stated by a popular writer on this subject, often here alluded to, that the system of

prey is the natural and necessary remedy of the system of "superfecundity," this is, in a very great measure, a palpable mistake of cause and effect, or in truth, of the Creator's design. That one of the purposes of the fecundity of animals is to replenish the earth, I have formerly shown; but it is also now plain, that its other, and even greater office, is the production of food. This superfluous fecundity is prepared for the uses of the predatory animal: and if this is ordained to consume that superfluity, it is not with a view of restraining it, but for the primary purpose of its own existence. This is proved by the relative distribution of the powers of fecundity. If the Cod produces six millions of progeny at once, it is because this food is assigned to other fishes, as their provision: for any other purposes, it would be an unwise appointment, (which cannot be admitted,) since even one fish would thus fill the entire ocean in a few years. And if, while the marine insects of the north are produced in endless millions, their devourer, the Whale, produces but one within the same time, we must conclude that these crowds were destined for its food; while I might confirm this view, from many other departments of animal life.

I may now proceed to the main object of this inquiry into the system of prey; its moral purpose being to furnish another proof of that beneficence which has provided a remedy or mitigation for evils that were necessary under laws established for good. As the violent death of animals should be attended with much pain, if they possessed sensibilities resembling our own, and as injuries short of death must also frequently happen from the assaults of predatory animals, so have I already made it appear, as I trust, that the Creator has constructed these in such a manner as to make

them comparatively little sensible to pain. Hence the chief evil to them is the simple privation of life ; which is also much diminished by that other, not less beneficent provision, which has deprived them of the knowledge, or anticipation of death, even when in the very act.

That they may be compensated for present evil in a future state, has been insinuated by some, and among others, by one pious sectarian leader whom I need not name. This doctrine speaks more in favour of the benevolence of the proposers, than of their philosophical or theological reflection. If the sufferings of animals are as limited as everything proves those to be, they cannot have much claim on so vast a compensation. Incapable of moral good and evil, and therefore of a moral trial, we cannot conceive a future state for them, when we know why, and why alone, it has been promised to us. And lastly, as we have no real proof of such a state for ourselves, except through promise, and under a revelation which assigns distinct reasons for it, as to us only, and without noticing them, while in those reasons also they cannot possibly be implied, I may dismiss a speculation which savours somewhat of an Oriental philosophy, though I could not well avoid noticing it, implicated as it has been with the present question.

To return : if the general law of a graduating sensibility through the animal creation has been proved, so must I point out, if very generally, how the details seem to indicate equally the intention of beneficence, and also to assist in the proof. I have shown, that through a very large range in the animal creation, a very low state of sensibility is attached to the most imperfect structures, appearing further, to graduate into an

almost total insensibility to pain, as we approach the vegetable kingdom, which, as the other great source of food, is entirely exempted from it. Now, extreme secundity and great numbers are also united to this low sensibility; while the tribes thus doubly gifted, are very widely the food of predatory animals. The instances occur in the sea, conspicuously in the Medusa, the Beroe, and thousands more; while it is equally probable, though we may not witness it as in those cases, that the minuter animals of the ocean, down to the microscopic ones, are the food, in thousands, of those which surpass them in magnitude. And that much of this prey is swallowed entire, as in the case of the Whale, thus suffering nothing of the possible pain from injury, may safely be quoted as another contrivance of the same beneficence. That the same general rules hold good on the land, in the endless tribes of larvæ and insects, in caterpillars, aphides, and thousands more, is equally certain; while if there seem exceptions, the cause may lie in our own ignorance, sometimes of the relation in magnitude between the preyer and the prey, and at others, of the actual state of sensibility in those which we fancy to possess feeling. The difference of bulk between a large bird and an insect, or between the Ant-eater and its food, is a similar case to that of the Whale: and in all these instances, we see that what has frequently been stated as an objection to the wisdom and beneficence of the Deity, is, on the contrary, a proof of both.

It is a much weightier objection, being the heaviest indeed to which the system of prey is exposed, that one large animal should be destined to destroy another of similar bulk, and also in that part of the scale of life where the sensibility must be deemed to approach

nearest to our own ; as, in those cases also, there is much violence, and often much apparent cruelty. And the defence here becomes very imperfect ; though if the former remarks on the sensibility of those animals be well founded, the suffering, even here, is more apparent than real. But there is one important fact, in these cases, which is as decided a proof of beneficence as any that I have here adduced, while it is also a special contrivance and compensation for an evil that could not perhaps have been otherwise avoided, as depending on the peculiar and needful structure of the higher animals. Whether the spinal nerve was thus constructed for this end, we cannot assert ; but there being no other apparent reason for such a singularity, which does not occur even in the brain, it is at least highly probable ; while, if it be the fact, we cannot fail to admire the singular beauty and simplicity not less than the mysterious nature of this contrivance. At one point of the neck, near the skull, a wound of this nerve produces instant death, and apparently without suffering ; while the place of death seems to have been rendered a single point, and that point constant. And though perfectly defended from all ordinary injuries, it is accessible to a certain degree of violence united to knowledge. That knowledge, which man has only discovered by experiment, has been given to all the predatory animals from their birth : while if it is a needful security to them for procuring their food, it is still more the provision which I have called it, for the suffering animal. Every one knows that this part of the spine is always the object of attack : while if there are some animals which, as instinctively, seize on the carotid arteries, the design is of the same nature, and both equally confirm the present views.

I may end. If man is occasionally subject to the evils arising from the system of prey, it is but one of the numerous contingent evils belonging to his peculiar condition: as this also is among the occurrences, or accidents, against which he has been provided by the gifts of observation, intelligence, and power.

CHAPTER L.

ON THE DEFENCES OF ANIMALS.

THE present subject is naturally connected with that which terminates the preceding chapter. The beneficence of the provision is obvious, though appearing to contradict the law of prey. Some fanciful reasons for the appointment have therefore been assigned : the most satisfactory one is, that it is a check to that superfluous destruction which might exterminate races, and with that, the supplies for the preyer itself. As usual, I must select from superabundant materials.

In many land animals, under all forms, the sole defence is the power of escape, though weapons are sometimes superadded. In the Hare, it is the defence against superior strength ; the power of the fore paws is efficient against the smaller enemies. In the Deer tribe it is the true, and, except under extreme danger, the only defence ; no instinct for thus making use of their powerful weapons has been allotted : they were given for another well-known purpose, and the instinct is limited accordingly. In the Horse family and the Cameleopard, the instinct and the power of using the hoofs are superadded. In the natural state, the fleetness of the Sheep, aided by the watchful and posted sentinel, and added to a power of climbing, like the Goat, where few animals can follow it, constitutes the general defence against single animals of prey. But, being gregarious, it is furnished with a further defence

against its associated enemies, the Wolves or others, in the horns of the male; taught to surround the defenceless part of the society, with a living and armed redoubt, under a system of tactics resembling that of the hollow square in military arrangements: forming an intrenchment which few ferocious animals will attack.

The instinct to fly is always added to the power of escape: so regularly are the powers and the propensities for ever associated. We may always pronounce on what is called 'timidity, in any animal, from knowing its powers; but the term is ignorantly applied. Few animals are timid, or cowardly, in the real sense of that word: so far from that, the pugnacity is often very remarkable, and equally unexpected. The Deer itself is an animal of great courage and ferocity; the most apparently timid and contemptible ones attack any superior power, when escape is no longer practicable; contesting even with man, as soon as familiarity has destroyed their instinctive fear of him. Even the Hare is bold and fearless, when not under pursuit: attacking, in a room, the dog from which it had fled in the field.

Few weapons of defence have been provided for the birds: and, such as they are, being limited to spurs on the legs, rarely on the wings, and still more rarely on the head, they seem intended for the same peculiar uses as the horns of the deer; belonging to the polygamous tribes. The power of flying is an ample defence against the purely terrestrial animals; as it is such even against their carnivorous fraternity: a very small number only, in the Falcon family, having the power of taking their prey on the wing, and this with much difficulty.

This also is the great mode of defence in the flying insects; while the velocity and the rapidity of the angular

motions render it effectual against most enemies : few but the Bat, the Swallows, and the Night-hawk, with their own peculiar tyrant, the Dragon-fly, being able to contest in flight with them, as neither of those could succeed in securing them, were it not for their capacious mouths. In the fishes, velocity is equally the predominant defence, though many are also provided with defensive weapons. Here, this power becomes especially effective, from that disposition of colour which renders them invisible by changing their level with respect to the pursuer, and from the imperfect vision at long distances, which follows from deficiency of light in the sea. Perceiving also that the more voracious fish are ill constructed for rapid motions, as is the Gurnard for example, and that the smaller species of the Shark tribe, though better formed, are exceedingly sluggish, it is probable that there is some arrangement of the relative velocities for this very purpose. It is difficult to conjecture how any fish could take a Mackerel, unless it were by surprise.

If velocity is a passive system of defence, concealment forms another : while the appointments for this are various : as, in some cases, it might be termed a system of fortification, by those who delight in distinctions. The ordinary modes of concealment in small animals need only be named : the instinct of burrowing unites habitation with defence. In the Rabbit, the Badger, the Fox, and more, this is familiar ; and it occurs in birds, in the well-known instances of the Puffin and the Sand-swallow. The Owl of South America is permitted a joint territory in the burrow of the *Lepus viscaccior*. Many animals which do not burrow, inhabit natural crevices or caverns : as the Fox, showing the power of reason over an instinct, declines digging in the rocky situ-

ations where it can find a convenient hole. The excavation made by a Sparrow, the nests of the Swallow and the Wren, and the much more remarkable suspended ones in hot climates, are other instances of united defence and dwelling, which natural history can easily extend. In the fishes, the burrowing of the Eel and others may be simply the pursuit of food ; but the flat-fishes conceal themselves in this manner, under alarm, and with great rapidity. That the inhabitants of the weedy and rocky shores make use of this defence, is well known to fishermen, and very remarkably in the case of the Loach, enticed from its hole by music ; as seems also to occur in the Trout. Whether the shells of the shell-fishes should rank here also, is a question of distinctions. Habitations as they may be, the shell of the Cowrie is a standing defence against all but the very minute worms, or those more powerful enemies, such as the Crabs and the Sun-fish, which break the shell or swallow everything : and thus are the power of adhesion in the Limpet, the quick hearing and the activity of the Oyster, the operculum and the retraction of the spiral univalves, and more than this, equivalent defences against similar enemies. It requires all the silence and cunning of the oyster-catcher to surprise the Limpet ; and nothing short of the vegetable patience of the Actinia could contrive to insinuate a tentaculum within the obstinate cover of a Periwinkle. The Razor-fish and the Cockle burrow, in addition, safe from all but the Sand-eel ; and the Pholades, with shells too feeble and too open for defence, are protected in the caverns which they have been taught to excavate in the rock.

In the crustaceous marine animals, and in the insects, the same system of defence prevails : admitting equally a little laxity of distinctions. The shells are

more than habitation, since they are both skin and bone to the animal ; but they are often defences, withal, and very effectual ones. The Cod swallows a small Crab, but it cannot break the shell of that which is too large for its mouth. The Beetle tribe, very widely, may be trod on without injury ; and we rarely kill an Ant by walking over their armies, unless it be on a very smooth and hard gravel walk. The Forest-fly, as all know, defies a strong hand. Among these also, we find the system of burrowing, and that of concealment in natural cavities or otherwise, very widely spread. The Crab burrows in the sand ; the Lobster hides itself in the crevices of rocks, in addition to the security derived from its hard covering and its defensive weapons : its safety seems to have been studied with unusual care : possibly for our use. Thus also do the brown Shrimps conceal themselves in the mud, and the horned ones among the weeds ; as this mode of concealment pervades all the lower marine tribes very widely.

In the proper insects, or rather in the parent worm, the structures formed by some of the sub-aquatic larvæ, out of gravel or fragments of sticks, are the most remarkable ; being habitations, and also defences ; as these last consist, partly in the security which they afford, and partly in the deception, since they are undistinguishable from the objects which they imitate. The Sabella, uniting sand in the same manner, may be associated with these. The hermit Crab also may take its place here ; since the empty shell which it chooses is equivalent to the den of the fox : but the burrowing insects and worms are so numerous, that no examples need be given : to hide, in this manner or in natural crevices, may be viewed as a sort of universal defence for the race at large.

A mode of concealment through colour, is the most universal of all the systems of defence; and it pervades all the races of animals. In the Hare, its efficacy is well known; as is the consciousness of the security which it affords. But in the quadrupeds, this is much less resorted to than in the birds; where it appears intended to deceive the predatory animals of their own class, rather than those of the earth: as it seems the only one which could have been adopted, where the weapons, the strength, and the velocity, are all, necessarily, on the side of the pursuer. In the Partridge, the Quail, the Woodcock, the Snipe, and more, the conformity of the colours to the ground is such as to conceal the animal from every eye; even from the acute sight of their enemies, the Kite and the Hawk. Thus do the smaller birds deceive them, even where the apparent conformity of colour is not great; since we often see the hovering Hawk abandon its pursuit, although the expected prey has not escaped. Under this system of defence, as under all others, the animals seem perfectly informed of its nature and value; as the Chameleon is, in its voluntary changes of tint; and thus, apparently, do the Lark and other small birds shift their position under the Hawk's eye, till they find the colour which they know to be efficacious. These are among the instincts, if instincts they must be called, which bear so near a resemblance to observation and reasoning: but be they termed what they may, they equally mark the Creator's care: while, as the philosophers who do not choose that He should have given reason to the inferior animals, are also those who do not think that He should be troubled with the care of His creation, it is for them to consider which of those methods would best save Him the trouble they so much fear.

If I need not pursue these examples through the Parrots and many more, the same mode of defence has been given to the fishes, in addition to their velocity or other means of avoiding their enemies. In the whole of these, the under part is white, while the upper is coloured in some manner: or the exceptions at least are rare, occurring also in those which seem to reside always among sea-weeds, where the purpose of colouring the whole body is the same. In the high-swimming kinds, moreover, the whiteness beneath is brilliant, while it becomes a dead and dull one in those which seek the bottom or are compelled to reside there. The object of the variation, as well as of the primary contrivance, is apparent; on reflecting that the enemy from below views them against the light of the sky, and that this light diminishes in intensity as it passes through a body of water. It is probable that the fishes can as little see each other in this direction, as we can discern them from above, where the several colours found in them are applied for concealing them from their enemies in superior positions. It is quite superfluous to say how perfectly this double provision declares the purpose: while, as in the birds, we find that the colours of the upper surfaces are varied according to the residence of the particular species. The Mackerel, the Herring, the Coalfish, and many more, frequent the surface; and their colour is that of a clear and deep sea, receiving a full light: it is the exact counterpart of the inferior defence in the same places. In the Pollock, and others, which swim deeper, the tint of the upper surface is lowered accordingly; and in the flat fishes it is that of the mud or sand on which they lie, differing also as the ground varies; as may be seen in the Sole and the Dab, compared to the Brill and Plaice.

Thus do we find the upper colouring varied according to the weeds and the rocks in which they reside, with the same care that has been bestowed in the Quail and the Partridge ; and further also, differing in the same species, perhaps, for aught we know, in the same individual, according to the casual colour of its residence. The rock Cod is brown or red, as the weeds beneath differ : and the same species of Wrasse which is red among the *fucus rubens* and *confervula plumosa*, is green where the *ulva intestinalis* and *lactuca* form its abode. Hence the errors of the ancient naturalists respecting species ; while the same continue to be committed in the case of the Trout frequenting different bottoms. The brightly and singularly painted fishes of the hot climates, such as the Choetodons, seem to form exceptions to this system ; but we cannot judge fairly, without seeing them in their native places : and if the exceptions are absolute in the gold and silver Carp, these at least are varieties produced by breeding.

In insects, the defence through colour is often the only one which they possess. The green Caterpillars, Grasshoppers, and Aphides, are among the most obvious examples : as the chief enemies are the birds. One of the former, frequenting the elder tree, can scarcely be distinguished from its bark. Thus also do some species change their tints as the Wrasse does, in varying their habitations. The *Noctua Algea* is yellow when feeding on the *Lichen juniperinus*, and grey on the *saxitilis* : and thus the Curculios are yellow, or white, or grey, as they reside among clay, or chalk, or common soil. But the contrivances for concealment are carried even further in some insects ; enabling them to imitate form as well as colour. Some caterpillars erect a part of their body, when adhering

to a tree, so as to resemble buds, or the stumps of branches; and the *Phryganea atra* is so like the black flowers of the sedges on which it reposes, that the sharpsighted birds often pass it over. The *Bombyx quercifolia* resembles a dry leaf, as does, still more, the *Mantes siccifolia*; together with the *Cimex paradoxus*: while every collection displays those singular imitations of green leaves, as well as dry, and of sticks, which occur in the former genus and in the *Phasma*: a former source of wondering tales.

But analogous modes of concealment, more or less departing from those, are numerous and various. Many insects cover themselves with sand, chalk, dust, or other substances which they inhabit, thus escaping notice; as some of them also use these masks for the purpose of ensnaring their prey. A domestic *Cimex* dresses itself in fragments of wool and feathers: the *Cancer phalangium* cuts off the leaves of a small *Fucus*, and fixes them on its long hairs, so that even a practised botanist may take it up as a specimen of the plant. In this case however, the purpose seems to be rather stratagem than defence; it is a trap for Shrimps: but it is applicable to both objects. Natural history must however be consulted on the subject of stratagems, since it possesses no peculiar interest for the present purpose. It forms part of the history of the mental faculties of animals: and, on that subject, the present work already affords sufficient illustrations.

Weapons of defence constitute another of the general contrivances for the security of animals against their enemies; while I need scarcely say that they are occasionally used for offence. I have already sufficiently noticed them, as occurring in the quadrupeds and the birds; while it has also appeared that many modes of

defence are sometimes allotted to the same animal. In the fishes, these weapons consist of spines disposed on various parts of the body; in the division termed Acanthopterygii, they are universally found in the fins. In general, they are but pointed instruments; yet are sometimes poisonous, as they are, very remarkably, in the *Scorpaena volitans*. In the rapid fishes, subject to be taken under pursuit, they are directed backwards; in such slow ones as the *Gurnard*, more indifferently, in various directions; while in the *Lobster* and the *Shrimp*, they tend forwards, to suit the retrograde motions of those animals when pursued. The *Perch* is a familiar example under the Acanthopterygious division; and thus is it enabled to reside with the *Pike*. This is a case in which we perceive the utility of the system of defence: within a narrow range of water, *Trout* would be exterminated by this voracious animal. In the *Diodon orbicularis* and the *Tetrodon hispidus*, the provision is much more remarkable: since the spines cover the whole body, and are, further, capable of being erected by inflating it. This is a degree of care for which we can perceive no adequate motive: but in this as in all else, a demonstration of resource and variety seems to have been intended. In the *sting Ray*, the distribution is very partial: in the piked *Dog-fish*, a single spine on the back fin seems to form a very effectual defence. In the *Scorpaena antennata*, the pectoral fins possess very powerful spines; while the *miles* and the *volitans* in this genus, with many more of the fishes of warm climates, present a terrific aspect, from the number and distribution of their weapons. Our own spiny-headed *Cottus* is familiar; the scorpijs of that genus is among the most formidably defended of all these animals. And if I yet name, under variation

of contrivance on this subject, the spines above the eyes in the *Holocentrus ruber*, the remarkable horn of the *Balistes*, and the *Monocentrus*, with its angular scales and its collection of spines above and below, almost supplying the place of fins, it is best that the reader should consult cabinets of natural history for what cannot be described to any purpose.

Entymologists have described the defensive weapons of insects so fully, that a very few examples will here suffice. The Stag beetle is a well-known instance of formidable armour : the *Cicada spinosa* and some others have horns on the thorax, for the same purpose ; and caterpillars beyond numbering are provided with hairs, or bristles, or spines, often very offensive, and sometimes poisonous. The defences of the Earwig are familiar : and the threatening attitude of the common *Staphylinus* is probably connected with some power of offence ; absurd as it may appear, to see this hostile denunciation exerted against the mountain, man, which might crush the animal at a step. Yet it restrains even him : such is the moral power of courage. Like the Hedgehog also, many of the hairy caterpillars, such as the *Bombyx caja*, have been directed to roll themselves up ; becoming thus unassailable by the birds. But on these modes of defence in the insects, entymologists do not seem to be well informed ; from not knowing against what enemies they are directed. The birds in general swallow the entire animal, defences and all : the Crow and the Bird of Paradise devour the largest beetles, by turning them head foremost, with the foot ; and no arms are of any avail against the Hedgehog and the larger reptiles which feed in this manner.

The simulation of death appears also to form one of the defences of insects : as it has been imagined re-

specting some of the larger animals: they have been instructed that their enemies will not prey on a dead body. This appears to be proved as to certain cases, because no imitation of the ground, or of the neighbouring objects, is attempted, and because the enemy attacks, should any betrayal of life occur: but whether this is the motive in the Woodlouse and some others, is doubtful, because many beetles roll themselves up in this manner, that they may resemble the gravel or pebbles among which they lie.

Among other miscellaneous defences, admitting of no classification, I have formerly pointed out the extinction of the light among the marine animals. The well-known case of the Cuttle-fish is solitary; but it is especially deserving of notice, because no other possible expedient seems to have been applicable to this awkward, defenceless and powerless creature, surrounded with enemies in every fish that swims. In the Skunk, and some others of the quadrupeds, offensive smells have been adopted as a defence; and the same system has been extended to the insects; though naturalists do not appear to know the cases in which they are rendered available. The explosions of an offensive vapour by the *Brachinus* seem to have led to this conclusion; as, in that case, the object appears to be what is asserted. But in the *Gyrinus*, the Bug, the carrion Beetles, the Cock-roach, the bright-eyed *Hemerobius* of our greenhouses, the *Phrygania grandis*, the *Tenthredo*, the *Staphylinus*, and many more which I need not enumerate, including some bees, ants, and butterflies, no proof of actual defence in this manner has been afforded, however probable it may be.

The last in this miscellaneous class, if also a means

of securing prey, is the electrical power, assigned to the Torpedo, Silurus, and Gymnotus, and, to the last, in a most dangerous degree. This is not merely, like some of the former, an invention for defence, without any apparently adequate motive, nor is it solely remarkable for its limitation to three obscure and rare fishes, unmarked by any peculiar utility; since, in addition to the highly abstruse nature of the contrivance, it is also an exception to the familiar facts of electricity. Whether it has thus been given that it might afford a clue to useful knowledge respecting the nervous system, future times may discover: it is a supposition at least which is countenanced by many other facts in creation; as I have formerly pointed out.

The poisons constitute the last of these systems of defence; as, in some cases, they are further useful, as weapons of offence and injury, independently of this, and for securing prey. This is the case in the Bee, destroying the drones, and in the Spider, securing its living food: and thus the insects which store larvae with their eggs as a provision for their future progeny, paralyze them for security. But the instances in this department, and even among the marine animals, such as Medusa and Holothuria, or in the terrestrial Lizards, or the Ornithorynchus, are of small moment compared to the case of the serpents, which has attracted the notice of the naturalist theologians, in a very unusual degree compared to its real interest.

If this is not an unnatural result of selfishness and fear, as of a disposition to seek for evils where assuredly they are not wanting, he who supposes this provision directed against us, is certainly not a very sound reasoner. The quantity of the appointed event, from this

cause, does not bear the most minute proportion to the death produced by the innumerable provisions for this which are in daily action. Were there no other cause but this one, there is perhaps not an individual in fifty millions who would not be immortal. It is the rarity of the event which excites all this attention : as happens in the equally rare instance of hydrophobia, absorbing the whole alarm amid a hundred thousand cases of mortality : while that attention proves, in reality, the smallness of the evil.

This evil is also contingent, as it is rare ; while the source of it is appointed for a useful purpose ; self-defence, or the securing of prey. The poisonous serpent seeks no enemy but its prey ; it is more willing to retire from a presumed foe, than to attack ; while also not attacking till it imagines itself in danger ; unless the fact be otherwise in the Rattlesnake, as is not certain : while, if it were, this species is compelled to give notice of its presence. Man's counter-defences, in these cases, are as perfect as they could have been made ; since they consist in his observation, his wisdom, and his arts, though all may possibly sometimes fail : while, to compensate these in the inferior animals, the poison has been rendered innoxious to the Hog, the Goat, the Vulture, the Ibis, and probably to many more ; lest purposeless death should have been the consequence to those who were perhaps unavoidably exposed to the hazard of this tribe. Inasmuch also as these are provisions against us, among whom some instinctive antipathy to this race seems inherent, there is an especial beauty in the invention of a defence which operates, for the most part, through causeless fear, leading to avoidance ; since the deserved reputation of a

few, serves to defend the whole of a widely inoffensive race.

Of the designed beneficence in the total system of defence thus contrived for the animal creation, it is now superfluous to speak, pointedly and minutely as it is every where displayed: but we are bound to remark the multiplicity and the variety of these inventions, with the universality of the care; and, not less, the appointed knowledge, or instincts, under which every animal has been instructed, by the Informing Mind, in the exact nature and use of the provisions for its security.

But it seems to me that this provision for animals leads to another inference which no writer on this subject has deduced from it, and which may be used to answer certain speculations leading to evil results. Is the coincidence of the character and conduct of God as deduced by Natural Religion with those which are declared in Revelation, is confirmatory of both, so we can sometimes deduce from the former, conclusions not so easily drawn from the sacred writings. If I have noticed some of these as they here occurred, the following inference from the defences of animals appears justifiable, as it may also be useful. The period of man's life, or the time, with the mode of his death, is unquestionably known to God, as is all futurity: but it is a very different thing to say, that, as far as our conduct is concerned, it cannot be averted by our own care and prudence; while to conclude thus, is to adopt the absolute predestination of Mahometanism. In this, as in all else, man has the privilege of his freewill: or he is not always necessarily compelled to die, more than to perform any other specific act. It is indeed gene-

rally admitted that he may shorten his life by rash or profligate conduct, by carelessness, and by neglecting the means of cure, under disease : while the warnings against deadly injury, through pain, formerly discussed, would be without purpose, were his freewill not empowered, sometimes even to avert or suspend the stroke of death. Thus do the wise and the prudent avoid that which falls on the foolish, the careless, and the obstinate : on those, we may suppose, who provoke God's neglect of them, by themselves neglecting the means of defence which He has appointed.

The wisdom and the arts of man are his defences against death under many forms, as the allotted weapons and stratagems of the inferior animals are, to them, under the system of prey: and like him, the animal which exerts itself, so as to make a good use of them, escapes, while the indolent or negligent is lost. And thus are we taught, with them, to avoid death by every means in our power, consistently, of course, with other and superior duties ; while the argument thus drawn is confirmed by that instinctive fear of death implanted in us, which may be counteracted, but is never extinguished while life remains.

CHAPTER LI.

ON THE SENSIBILITY AND ENJOYMENT OF THE VEGETABLE CREATION.

THE goodness of the Creator in providing for the happiness of the animal world is, I presume, as generally acknowledged as it is obvious. But it is the universal opinion that plants are incapable of feeling, and insensible to enjoyment. Even they who have been recently inclined to grant them some nervous system, do not admit the possibility of the latter; while there are many who still attempt to explain all their actions on mechanical principles independent of life. I am willing to believe that they possess enjoyments, thus extending the Divine beneficence: and the purpose of this chapter is, to detail the grounds for that conclusion. It cannot be proved, for obvious reasons; but there are facts which render it probable: while the final inference as to the value of this probability, will be drawn from our general belief respecting the goodness of God.

The basis of proof must be sought in that sensibility generally; in the demonstrations of sensation through a nervous system, of motion through internal efforts, and further, if such a thing be, in motion evincing sensation followed by action: while the proof should be perfect, if it can be shown that there are motions implying choice or rejection, and therefore, comparison and volition, under some form, however modified from

those which occur in animals. And if it can be further proved, that there are animals which display no other or greater evidences of sensation, and of comparison, choice, and volition, it will be for philosophy to ask itself on what grounds it decides on their enjoyments, and for what reason it refuses to the plant what it grants to the animal. Thus at least will the question be placed in a fair light: as those opinions which are but the prejudices of habit, derived from terms, or from an ancient atheistical philosophy, should be rendered null; leaving us free to form inferences, or at least rational conjectures, respecting the probable existence of enjoyment in the vegetable creation.

And the inferences thus made should be supported by our knowledge of the character and conduct of the Creator. We do not doubt that the lowest of animals, conduceing to the enjoyments of superior ones, are themselves allowed their share of happiness; that the rooted and imprisoned creature which is employed in building up islands, is happy in its occupation. It is a narrow and unworthy view of the Deity, to believe that the vegetable world, appearing to enjoy, is not also a happy one, in laying the foundation of all the enjoyment of the animal creation. I not only wish to believe it, but believe it from the *à priori* conclusion alone: nothing but absolute demonstration would overturn that belief; and, of this, there is no more chance than of the reverse; while there are high probabilités on this side, and nothing but a prejudice to oppose them. I do not envy those who conclude otherwise: but the ridicule which may be thrown on such a belief, would be easily retorted on opinions founded in ignorance and neglect, and supported by prejudices.

I formerly showed that the principle of the vegetable

organization and growth differs in no respect from that of the animal one: while even as the internal anatomy is concerned, there are animals whose structure approaches so nearly to that of plants, that we have not yet satisfied ourselves respecting the differences. There are some which have no central mover of a circulating system; in which therefore the circulation must resemble that in a plant. There are some equally without an assignable nervous system; and, in the plant we have no other ground for denying its existence, than that we cannot find it. There are animals without organs of sense, even without evident ones for touch; as, on this subject, the untentaculated Medusæ does not show so much sensation as the Mimosa. There are many without locomotion; and some which are divisible without injury, and multipliable by division. These things therefore do not form essential and universal distinctions. If such a distinction be sought in the fact of being nourished through a stomach, the nutrition of the Epidendrons and others, through their leaves, is a perfect analogy; to take no notice of the fanciful resemblance to this organ in Sarracenia. And lastly, the mode of propagation is not an universal distinction, when some animals propagate by offsets; as well as by division. The chemical compound differs; and, as yet, it is the only universal difference we know: but it is a difference which does not affect the present views.

The life possesses similar powers in both, being the ruler of the chemistry, and the agent in the organization. It pervades the whole plant, and is the source of those motions which cause circulation and secretion; which must be muscular, because nothing else could produce the effects. I formerly showed the grievous ignorance of the hypothesis which attributes this circu-

lation to capillary attraction ; but the peculiar philosophy which chose to consider plants as mechanical machines, has more probably been the cause than the effect of a system, as much at variance with the laws of hydraulics as with the actions of plants themselves. It is marvellous that it should still be maintained by any one pretending to philosophy. The fluid continues to ascend in the vessels after the branch has been separated ; in the Geranium it proceeds to expand the flowers for many days : the liquid in a capillary tube does not quit the bottom and proceed upwards. And the flow ceases when the life has been destroyed by lightning or poison, though the tubes are uninjured ; while, under the mechanical hypothesis, it should not only continue, but go on to produce leaves and flowers, with all the usual secretions. I know not why those who allow that a contractile property belongs to the vegetable tissue, should yet deny that plants possess muscular power. That power is contractility ; and that the muscular fibre necessary for it is not always visible even in animals, is proved by many inferior ones, in which there is contractile and thence muscular power, in that which the microscope itself shows only as a jelly.

To what purpose indeed do plants possess life, if it is to produce no consequences ? It would be superfluous, if everything was effected by mechanical power. It is surprising that this simple conclusion, at least, has never been drawn by those philosophers ; not to notice the incomprehensible ignorance, which, under the idealess term development, can speak of all the complicated chemistry and growth of a plant, as if it was but the unrolling of a coil of paper.

This answer was here inevitable, because it would be otherwise impossible to proceed in the present in-

quiry, where the fundamental principle consists in the vitality of plants, producing action. That it is one of the numerous offspring of the mechanical and atheistical philosophy it is easy to see: nor can aught else explain the obstinacy with which it has been maintained; since it can scarcely be accounted for by mere want of observation and reasoning.

The life of plants, thus acting to produce internal motions, must produce them by means of contractile or muscular fibres, as in the animal; partly because of the resemblance of the vessels, and the identity as well as analogy of the chemical secretions; and partly because there is no other conceivable method. This implies a nervous system, be its chemical nature and mechanical distribution what they may. In animals, when it can be traced, we know that it is the means of communication between life and the muscle; and continuing to admit it as such in them where it ceases to be perceptible, we have no reason to deny it to plants, merely because we cannot trace what, arguing from the lower animals, we do not even expect to find.

But its presence in plants does not rest on this analogical reasoning alone: it is inferred from the similar action of the same causes on both classes of organization; while it is plain that there is no reason for limiting the nervous power to a fibre of one chemical quality. Some recent experiments have indeed pretended to demonstrate this nervous system; deciding also that it was a soluble substance, and inferring that it was a species of animal compound. The experimenter is not worthy of credit; while chemistry can perceive that his results amount to nothing. It is bad policy to attempt to prove truth through what is not truth; nor is this hypothesis necessary, since the Creator could as well

enable a vegetable as an animal fibre to conduct the nervous energy, as He has given the power of muscular contraction to both.

In animals, the nervous power is destroyed by substances, or actions, which derange no organization ; operating in some mysterious manner on that system. Such are electricity, extreme cold, and the narcotic poisons : while the power of mental emotions in doing this, in man, proves that the effect may be independent of any injury to the organization ; as it apparently is in all these cases. And the same effect occurs from the same causes in plants. Electricity destroys the life, even in the seed, without the slightest disorganization ; and so does cold. These cannot act on life, except through the intervention of some material organ, which must be a nervous system, equally, in this case ; or, what is equivalent, some structure which is the peculiar residence of life. When they are killed, like animals, by the metallic poisons, it might be said that the injury was committed on their fluids, disabling them from carrying on the work of their chemical laboratory ; but they are equally killed by the narcotic poisons, while we know, that in animals, the injury produced by these is directly on the nervous system. And the death of plants from these causes is subject to even less dispute than that of animals ; because the simplicity of their circulating fluid does not permit those chemical changes which might be supposed the cause of death in the latter, as their solid materials also oppose such results. Nor can we explain on any other grounds, that much more refined sensibility to conditions of the air which I formerly pointed out ; while, in this delicacy of sensation, they far exceed any animals that we know. Nothing but a nervous system can be affected by smoke,

for example, or by the effluvia of human society ; while there is nothing by which they prove this more, than by their dying under that minute quantity of sulphurous acid in the air, which animals bear without inconvenience.

If they are injured or destroyed, so are they stimulated to action by the same substances which act on animals. Such are camphor and ammonia, acting on the nervous system in the latter : and such also appears to be the action of the acids and the salts, or the merely stimulant manures. But the natural stimuli of light and heat offer a still stronger argument. It might indeed be said, that heat acted on their fluids alone, though we know that in animals, its effect is on the vital powers : but light can stimulate nothing but the principle of life, as in that it must act by the intervention of a nervous system ; while the consequence is that increased activity of secretion which must depend on muscular power. Thus, under both forms of life, the conclusion is the same. In the plant and the animal equally, the life governs the chemistry, through the intervention of nerves producing muscular motion, while acting in consequence of initiative causes, which are sensation, when stimuli are applied ; should there indeed be any other cause under which life ever acts.

Plants therefore are sentient and acting beings ; though the conclusion, thus briefly stated, may shock ancient prejudices : since the facts are incontrovertible and the reasoning is simple. They are sensible to agreeable and disagreeable impressions, since these moral terms may be safely borrowed, when excited action, health, and vigour, are the consequences of the one, and languishment and death, of the other. Hitherto, however, these actions are those of the chemical

organs only : we cannot witness them ; knowing them only through their effects and the analogy of animals, in which we know that secretion, for example, is proportioned to action, as this latter is to stimulus. But it remains to inquire what other marks of sensation are displayed by plants ; while, as we can only judge of those by their actions, it must be first asked what their visible actions are.

They do not possess the power of locomotion, as entire mechanisms : and this indispensable part of their constitution has perhaps been the chief reason why their powers of motion have been denied, though few perceive the sources of their prejudice on this subject. How should truth ever be perceived, when so few think at all, and when those who think of creation are more anxious to display their own ingenuity, or prove their own systems, than to inquire what the Creator intended and has effected ? But many animals are equally fixed to the places where they were created as is the vegetable world, while, in numbers, exceeding them by myriads. The want of locomotive powers does not exclude the power of motion in plants ; while these also are of a very decided character, produced by internal efforts; consequent on external causes, very often, if not always; which, being stimuli, must therefore act on sensibility.

Here, as before, I must begin by examining another branch of the mechanical hypothesis; since it is impossible for truth to be received or understood till the reverse is disproved. There are two distinct assertions here, as the assigned causes for these motions. Where they are slow, the part is said to be attracted by light: the more rapid ones are said to be the mechanical movements of springs : but there are many other modes of

motion in plants which neither of these assertions will explain, and which therefore, it is probable, the hypothesis has found it convenient to overlook.

The tendril is said to follow the course of the sun, because of the attraction of light; and thus of the motions of leaves and flowers in all cases. Though all tendrils did turn in one direction, and that all voluble stems did the same, which is not the fact, since the scarlet Bean and many more move reversely to the Hop, the forgetfulness of this hypothesis is more remarkable than its puerility. It may be asked how it follows the course of the sun when the axis of the spiral is at right angles to that of the ecliptic, when a tendril or a voluble stem is extended horizontally, or is bent downward, while it twists, instead of proceeding upwards: while it is also obvious, that in the most favourable case, one half of its course is opposed to that of the sun, unless it were under astronomical laws; and as it is also common for tendrils, in the Vine, the Briony, and more, to reverse their direction suddenly, and without any apparent reason. Of such idle words do these hypotheses consist. But the antiquity and the connections of the whole hypothesis respecting the attraction of light for plants, should form its sufficient condemnation; since it is but the doctrine of elections and sympathies. It is the fire in the grate, attracting the air, the medicine attracting the humours, and so forth. He who talks of light attracting a leaf, should ask why it does not attract a dead as well as a living one, or why it does not attract a feather rather than a rose. They who have attributed the more marked motions, such as that in Mimosa, to springs, have not informed themselves respecting the nature of a spring. A retained spring acts with the greatest energy at first; and such

is not the motion in any vegetable except the Kalmia, where the stamen does appear to be a spring under a detent, like the seed-pods of the Cardamine and Impatiens. Though the closing of the Mimosa were the result of a spring, by what power is it restored to its place, and in what manner can light increase the energy of a spring? But I may dismiss the whole of an hypothesis which does not even attempt to explain the sleep of flowers, their closing under rain, and the various other motions into which I must now inquire.

The expansions of flowers to the light offer the simplest examples of these motions, as far as this stimulus is concerned: but even here a mere mechanic would ask the question which seems to have been always forgotten by this philosophy, as we all overlook the fact from its familiarity. Size or weight are of no moment, as the principle is concerned: no body can be moved without a moving force; and the petal of the Daisy requires one to bring it from the vertical to the horizontal position, and reversely, as much as does the mast of a ship. The turning of the leaves, and sometimes of the entire plant, towards the sun, are proofs of very great muscular power; because the weights to be moved and that rigidity of the parts which must be overcome, are often very considerable. In a limited sense, this is locomotion: it is slow indeed, but mechanics have still the same answer: it cannot be effected without force, and that force is an internal one. The last case which I need notice is equally familiar. If the light is admitted through a small aperture, plants turn to seek that point, or prolong their growth for that purpose; directing themselves towards it with the most unerring accuracy. An animal would do this more quickly, but not more certainly: we admit it here, to be a desire producing

volition, followed by spontaneous motion : it must be explained what is the mode of proceeding in the plant, if it be not the same.

The nocturnal sleep of plants, or the closing of flowers at night, admits of the same remarks, and not perhaps of any others ; but it is otherwise respecting that sleep, or closing, which occurs in the day-time, in some flowers ; as in *Anagallis*, *Tragopogon*, *Calendula*, and many more, long familiarized by the popular works on botany : while the accurate periods which these observe, is even a more remarkable fact. Here the stimulus, or the "attraction," of light, is in full force ; yet the plant disobeys it, under some other instinct of which we can give no account : a motive so much more powerful than the otherwise prevailing one, as to gain the superiority. The closing of flowers in rain is evidently intended to protect the stamina ; but in this case, the plant is a voluntary agent, under some instinct, or command, consequent on its peculiar sensibility. This sensibility is very striking in those which close before rain, as many do : while it may be added in proof of their nervous systems. And that the motions are not hygrometrical, is proved by the Snow-drop, which will continue open while all its companions are firmly closed, provided itself be sheltered by a bush or a shed. In every case of this nature too the conduct of flowers is remarkable ; because moisture is a friendly power : but in this one, they have been impressed with some feeling, that it is injurious, while they act accordingly.

In all these, as in other instances, the muscular action is very powerful, even in the feeblest petals : it is like that of the sphincter muscles ; nothing but absolute force can overcome it : while on removing that, they recover their places during the prescribed period, yielding

readily when that is past. If also these muscles are most active for expanding the flowers, under sunshine, so are they during the youth and vigour of the plant. Nothing but permanent force can keep the young Daisy open when it has closed for the night ; but as it becomes older, it offers less resistance, and at length ceases to close, for some days before the petals fall. This is youth and age, affecting muscular power : though the fact may be that this loss of power occurs after the anthers have done their duty.

The motions of the *Drosera* and the *Dionaea* under the contact of insects, are, not less, muscular motions consequent on some sensation produced by that stimulus : while the extreme slowness of the former proves this to be the fact. In the *Mimosa* the stimulus producing the motions is familiar : it is true, that we see no purpose ; but what I have already said proves that the action is a muscular one. In the tendril, it is evident that the inflexion is the result of sensation, under an instinct of volition given for a necessary end. It proceeds without bending, as if seeking a support ; when, having found that, it acts, embracing the body which it feels. Nor is this all ; since the stimulus of mere contact will not excite the full action of this organ. It is in vain that the sensible extremity, or any other part, be even tightly embraced by a ligature : it may bend at that point, or possibly make one turn ; but let a weight be appended, and the full action commences and proceeds, so that even the slender tendril of *Briony* will lift weights extending to an ounce ; while the inflexion does not proceed from the point pressed on, but takes place at a remote part, or through its whole length at once. If this is not sensation producing muscular action, I do not know how that can be inferred respect-

ing the tentacula of the *Hydra* and *Actinia*, where the conduct is precisely the same. It is a hand seeking in the dark, and grasping what it has felt, by the action of muscles remote from the sensible point.

The case of the radicle and plumule in the germ, formerly stated, appears to be one of those motions in plants which are independent of external stimulus, or sensation, or to depend on an implanted instinct, like the closing of flowers before rain ; though for the present purpose that is of no moment. It is an effort of will ; since there is an object sought, and one shunned, by each part, while the desires are reversed : and they are shunned and sought under a perseverance which nothing but death can quench. That the germ can be killed by tormenting it, so as to make it reverse these actions frequently, is an ample proof that the motions are not mechanical ; this is the exhaustion of vital power. We do not conjecture any external stimulus in the Poppy : but it is commanded not to flower till it has erected the bud ; and its efforts to obey are not less persevering than those of the germ, or than those of the tendril and voluble stem, when we misdirect them. I need not repeat, that no mechanical proceedings can explain this conduct ; especially in the former case, where the flower stem begins to grow again, after it has ceased.

I do not perceive that the remarkable motions of the stipulae in *Hedysarum gyrans*, or of the leaves in the Sentinel plant of Dominica, prove anything more than the existence of muscles ; since we can conjecture no object in these singular movements, and can see that they do not depend on external stimuli. The former is familiar : in the latter, less known, one, partially pinnated leaf out of the whole number, is always de-

flexed close to the stem ; rising after a certain time, and resuming its erect position, when another takes its place, and thus in a perpetual rotation through the whole plant.

The last example of spontaneous motion in plants is among the most striking, while it is a familiar case. An exposed root will deflect towards a moist place or a wet sponge ; as one which has escaped from a dry wall will prolong its growth to seek the earth ; producing no radicles till it has found what it was pursuing. This also has been termed attraction : I need not answer that word again. And this fact is even more remarkable than the search after light : that stimulus may always be considered in contact, and therefore an undisputed one : but the distant water cannot act in the same manner. Still, the plant, discerning what it desires, and exerting itself to reach that, must act through some sensation of its presence, or the result would be impossible ; and thus a high delicacy of discernment as to what is desirable, must be admitted : as the act of volition can no more be disputed in this case, than in that of an animal seeking its own food. The progress of the plant is tedious, because its powers are limited : but there is no essential difference.

This will suffice as to the further facts. Plants have been already proved to be living beings, provided with nervous powers and internal minute motions, resembling those of animals : it is now proved that they are sensitive to external stimuli, and that they act in consequence of sensation ; performing other kinds of muscular motion essential to their welfare, and, under these, seeking what they desire, or what is good for them, while avoiding what is injurious or displeasing. This

implies a power of election, inferring comparison, of some kind ; as the consequent actions must follow some mode of volition. If not, the appeal for explanation must be made to metaphysicians, as that respecting the motions was to mathematicians : the botanist cannot be allowed to decide on subjects which he has never considered.

It is not essential however to the final object of this chapter, of what metaphysical qualities this election and volition may be ; since the sensation of enjoyment may be attached to the blindest compulsory instincts, as it is in animals, where the fact of election, with volition, doubtless occurs without any consciousness of either. The purpose here is to prove the fundamental resemblance between the two as essential to the final object to be proved : while it is fruitless to discuss metaphysical subtleties, where we can obtain no light. And it is equally evident, from the facts just stated, that there are, in plants, instinctive actions independently of external stimuli, while these also are for desire and avoidance ; as there are a few others, of the motives of which we can as yet give no account. Now the power of receiving an instinct (and we can use no other term) proves an organization of some mental nature, or of a nature analogous to that of animals : since, if I have shown that no mere mechanism could perform the motions of plants, far less could any system of machinery receive commands to produce or originate these motions in them, under the various circumstances in which they occur. If there is any argument in the mechanical philosophy to answer those things, it must be brought to bear accurately on every point ; since these have been stated, and cannot be answered by vague phraseology or general assertions.

Omitting, of necessity, the strongest argument in favour of the object to be proved in this chapter, I must now inquire into the nature of the sensation of plants ; since on this it must finally depend, whether or not they are susceptible of enjoyment. In the case of the animal actions maintaining life, I formerly showed that there was no consciousness of sensation ; and it is doubtless the same in plants, as the vital actions are concerned. The question now is, whether they do not experience other sensations attended by consciousness ; being sensation, in the popular sense of that term.

For this however I must return to the animal creation, and inquire on what grounds we believe animals to be possessed of sensations of consciousness, so as to be susceptible of pleasure or pain : while it will perhaps surprise those who have never reflected, to be told that they have no more reason for it in the one case than in the other ; and that in the case of the inferior animals in particular, they have no proof of what they are accustomed to believe.

Judging by ourselves, we infer enjoyment, and the reverse, of other animals, far down in the scale of life ; and philosophically, when we determine by their conduct. We continue to do the same, still further, because not well perceiving where we should stop : yet if there were no animal intermediate between Man and an Actinia, we should not be quite justified in forming the same conclusions, so enormous is the difference between these extremities. Nevertheless, we should conclude the same ; but it would be from the prejudice attached to a term. The Actinia is an animal ; and we have connected the ideas of consciousness, of the sensations of pleasure and pain, with that of an animal. But there is no philosophy in this, and in logic therefore, no conclusion.

A sound philosophy must seek for reasons on which to conclude ; and they are the following. We know of certain impressions on ourselves, and in the animals nearest to us ; and perceiving in them, consequent actions, similar to our own, we infer of them that which we ourselves feel, consciousness and enjoyment. In the lower animals as in the upper, we see that certain stimuli are applied, and objects presented, and that there is consequent action ; which is therefore presumed to imply consciousness and volition. They display more activity under proportional stimuli, they choose or reject, seek or do not seek, pursue according to their powers, rest or languish under the want of them, and finally die if deprived of them. It is the rational inference from analogy, that the things sought, exciting desire, are pleasurable, and that those which are shunned are painful ; and thence we justly infer consciousness, comparison, election, volition, the desire of enjoyment and the capacity of enjoyment ; as also reversely, the power or the act of suffering. Thus do we justly argue, that all animals displaying these indications are conscious beings, capable of enjoyment ; as these form the only ground for this judgment.

Now it will be seen that the conduct of plants, under similar circumstances, is perfectly analogous to that of animals ; the only differences that exist, depending on those of the objects desired, or on the different acting stimuli, and on the differences in the active powers. Each division pursues certain objects, as far as its powers allow : each is benefited by the attainment : each rejects certain objects, and if it cannot succeed, suffers. The plant shows its satisfaction in the possession of the sunshine which it seeks, by opening itself to the influence, and it is vigorous under that stimulus :

deprived, it languishes. It seeks water, as the animal does food, and its vigour is the proof of satisfaction which it displays: if deprived of that, it becomes feeble, and dies. It absorbs fresh water, and the air which it approves: it rejects both, when it disapproves them; and, thus disapproving, it also suffers, or dies. It is the same as to the instincts. Like the animal, it pursues what is beneficial, and rejects what is hurtful; and, like that, it is obstinate in its pursuits, to the extent of its powers; while if those powers are overcome by opposing ones, it suffers in the same manner: dying, if the point which it cannot carry should be an important one. The conclusion as to both sets of beings ought therefore to be the same, if we are to be guided by observation and reasoning, and not by terms and prejudices, or by the hypotheses of ignorance.

This general conclusion will perhaps appear more convincing, if I slightly retrace the scale of animal life for the purpose of a closer comparison of some of its portions. The anatomical organization in the animal becomes gradually approximated to that of the plant, by the disappearance of a prime mover of the circulation, by that of a nervous system, and by the equal disappearance of organs of sense; while, in some, even the organs of feeling and apprehension do not exist. And when the *Hydra* can be inverted, without injury to its powers of digestion, it is plain that it is no other than as the leaf of an *Epidendron*, or that it would be equally fed, if the food could be retained in contact with the exterior of the animal. This is the true approach to vegetable life. There are also rooted animals, as we have seen, giving no sign of volition, but the motion of the tentacula, seeking light, as well as food; while there are, still further, some which give

no signs of motion of any kind, animals which might be compared to a lichen or a fungus, and which we should not believe to be animals but for their chemical composition.

Rejecting the prejudice attached to the term animal, we judge justly, that all these beings are possessed of consciousness and enjoyment, as long as we can infer desires through pursuit, whatever be the motions evincing volition. But we also perceive, and admit, that there is a gradual exhaustion of that metaphysical perfection which commences with the top of the scale, accompanying the anatomical structure in some manner, under which everything that should mark consciousness of volition gradually disappears; while, at this point, we have no longer any right to infer sensation or enjoyment. But long before that, there is one at which we have no more right to infer it of the animal than the plant. The flower seeks the light, and expands to it, just as the *Actinia* does: as far as evidence can prove anything, the conclusion must be the same for both: there is exactly the same proof of consciousness and volition, and therefore the metaphysical powers are the same, whatever they may be. But if we proceed further down the animal scale, we arrive at a point where the demonstrations on the part of the plant are far greater than those of the animal; finding active motion to balance against the immoveable being, with the strongest marks of choice and rejection, of content and discontent, to compare with the entire absence of any appearance of sensation or opinion. If the *Daisy* and the *Poppy*, the germ struggling for the surface, the tendril searching for support, the root seeking water, the *Mimosa* and the *Hedysarum*, are without metaphysical powers, without sensations of conscious-

ness, whence should the Sponge and the Alcyonium possess them?

To conclude as the conclusions have invariably been, is to conclude against evidence, not merely without it : while if there is any other source of judgment in this case, than the prejudice, it is because the one organization is of a different chemical composition from the other ; which is a reason of no more value than to say that the one is a plant and the other an animal. There is but one species of evidence ; and by that we must be guided, if we pretend to reason at all ; though, as in all other cases, the influence of reason may be safely assumed as null.

This argument may now be summed up. It is not proved that plants possess consciousness and the power of enjoyment ; but it is proved that they display the same marks of both as the inferior animals do, that we have no other ground of judgment in the one case than the other, that what we grant to one we must grant to both, if we pretend to observation and reasoning, or, that if we refuse these powers to plants, we must also refuse them to the lower animals. And philosophy at least should be able to divest itself of the prejudices attached to the term animal, though the vulgar may not. Each shows a similar sensibility to stimuli, and often to the same ; while, in both, these produce similar actions. Each discriminates between friendly and noxious powers, selects and rejects, seeks and perseveres, attains and prospers, or fails and suffers. If the one compares before it chooses, so must the other ; if the one cannot move without some kind of volition, neither can the other ; if a volition and a choice must be preceded by a sensation of consciousness in the animal, so must it in the plant : and if we infer of the

former, that the possession of what was sought is a source of enjoyment, the plant must also be susceptible of the same: a happy being in that world where there are so many provisions for the happiness of all.

I believe that the term consciousness will here be a stumbling block to metaphysics: as must also be the words comparison, choice, and volition. These terms, of which we have no modifications, are invented to express certain conditions of the human mind; whence we revert to those powers or actions as we possess them ourselves: while, being sensible that the differences between a plant and a man are extreme, we cannot permit ourselves to apply to the former, words conveying those ideas; and therefore refuse to grant anything.

Unfortunately, there is no remedy, for those who are unable to think otherwise than as the habitual terms direct. Nor is this the only source of the difficulty. These words mean much more than they express, through association with other conditions or acts of mind: the ideas in question are complicated ones; and we do not perceive it, for want of that analysis which demands reflection. Thus the term consciousness brings to our minds the whole train of sensations, reasonings, resolutions, and actions with which it is connected; so that we do not, and perhaps cannot, conceive it as a distinct quality or condition. And it is the same with the terms comparison, choice, and volition; the standard being ourselves, and the other associated ideas being inseparable.

Yet the least reflection on the facts, on the metaphysics of the inferior animals, should convince us of this error; and that although we have no other terms, these qualities may exist without the combinations which they carry in our own minds, through the associations

that we are not careful to separate. We are sure of the existence of such qualities among the more perfect animals, and equally certain that they cannot be associated as they are in ourselves, from the limited nature of their faculties. Thus we ought to admit that consciousness may be, or rather must be, a comparatively simple condition of mind in a quadruped or an insect ; while, if we descend in the scale of animal life, we may conceive it still more simple in proportion to the imperfection of the mental faculties. And lastly, finding animals without a nervous centre, or without discoverable nerves, we are compelled to deny them all mental faculties, in as far as we judge of those through ourselves ; though, as we cannot refuse them that consciousness which is inseparable from life and action, we must then perceive that it may be a condition of mind of absolute simplicity : yet thus convincing ourselves by reasoning, of what it is impossible we should ever feel. We naturally view it as a quality, or portion, or condition, of mind capable of thought and reasoning, because we feel it as such : but this experience in the lower animals shows that it has no such necessary connexion ; and therefore there is no reason why it should not equally exist in plants. The “mind of a plant” is the real term of offence, and the great source of the objection : but it is only such, because consciousness has not been considered as separable from the general constitution of mind under its higher faculties. Let the distinction be made as I have here attempted to draw it, and the whole metaphysical difficulty vanishes.

Metaphysicians themselves seem to have been the true cause of all this difficulty, by making man the standard of mind, and inferring everything from what

they imagine themselves to have ascertained respecting his mind. Let their knowledge of the human mind be what it may, this is to apply a false scale : but the truth is, that whatever they may understand respecting that, they are ignorant of the nature of Mind, and therefore draw false inferences respecting the inferior beings, from their own systems, not from knowledge. It is thus also evident, that they lay down their own rules for the conduct of the Deity on this subject, or conclude respecting what He can do, or has done, from their own ignorance. We shall probably never know the nature of Mind ; but, in the mean time, it is plain that metaphysics have no grounds on which to decide against the existence of consciousness in plants, while I have shown many reasons why they should possess that quality, which is the indispensable foundation for the power of enjoyment.

If these inferences should be the truths which I believe them to be, plants derive pleasure from their existence, at least to the same extent as the inferior animals ; as the sources of that pleasure will now be obvious, and as the demonstrations to which I have already alluded, will be proofs of its actual existence. It might therefore be argued, that admitting this, they should also be exposed to suffer pain ; which, if they were, the beneficence of the Deity would be very largely nullified, considering the injuries to which they are exposed. But I formerly showed respecting animals, that the capacity of enjoyment is dissociable from that of suffering, and, apparently, entirely so in the lowest parts of the scale ; so that the general conclusion respecting this beneficence will remain unaffected. Nor, admitting these views, does it appear improbable, that in plants as in animals, there is a gradation of

enjoyments, accompanying that of organization and sensibility : evanescent in the fungi and the lichens, as it is in the sponge and the alcyonium.

Such are the reasonings : it is for others to judge of their validity. Whatever may be thought of the induction, this at least is not the statement of a poet or an enthusiast. Yet it would not be easy to form such an opinion under these cold arguments, and renounce all feeling respecting this beautiful and interesting department of Creation. If I could persuade myself that it were not true, I should be sorry to believe it false ; nor do I know how to do this, when I see these living beings giving every sign of enjoyment that their natures permit. I cannot believe that the flower which brightens and expands in the sunshine, which seeks and follows the source of light, does not enjoy, with the rest of God's creatures, the life and the happiness which the great luminary diffuses over all existence ; nor do I know how it could better or otherwise express its delight. I see the lowly Daisy itself open its bright eyes to the morning sun, close and droop when it withdraws itself, and sleep when it goes to rest ; and I know not what more an animal could do to explain its feelings. I do not wish to believe otherwise ; for it would be to renounce the sympathy which we possess with this lovely and innocent race of beings ; that instinctive sympathy which seems to assure us that they partake of our feelings, and from which we cannot divest ourselves ; often also, almost persuading us that they are sensible of our cares. We may admire the beauty of inanimate objects, but they excite no affections : we feel that there is life in the flower and in the plant, and our sympathies are with life : as if the Creator himself had commanded us to believe in what ignorance and preju-

dice refuse, or the false reasonings of philosophy would make us renounce.

It must be so. We are all the offspring of the same bountiful Parent, the source of all happiness; and I cannot believe, that wherever there was the possibility of enjoyment, He has not provided for it and given it. I will not believe that he has given sensations productive of no pleasure; desires, with the powers of attaining, without happiness in the attainment. I cannot believe in life without enjoyment; because I should then see that error in Creation, which I cannot conceive, and have never yet seen; a deficiency of goodness in the beneficent and kind Parent of all.

I trust that the happiness of the vegetable creation is proved: it is best to believe in it, though it were not; for it will enlarge our benevolence, and with that our own happiness; while it will augment our love and gratitude to God himself, when we can cast our eyes around creation, and see the earth crowded with millions of beings, His living children, all enjoying the happiness which He has appointed for them, and giving the only testimony of their gratitude which their natures permit, by rejoicing in the blessings in which He has allowed them to participate.

DIVISION VI.

OF THE

GOVERNMENT OF THE DEITY,

&c. &c.

VOL. III.

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CHAPTER LII.

OF THE GOVERNMENT OF THE DEITY, PROVIDENCE. ON GENERAL LAWS, AND ON SECONDARY CAUSES.

IT is incorrect language to call the Government of the Deity an attribute. It is a fact respecting His conduct: and some mode of government must be admitted, since the Creation is governed, just as a Creator must be inferred from the existence of a Creation. To conclude otherwise, even in pure philosophy, and without respect to religion, is so nearly equivalent to atheism, that this term has very generally been applied to such an hypothesis; while Cicero is content with passing a very different censure on it:—"Coelestium ergo admirabilem ordinem, incredibilemque constantiam ex qua conservatio et salus omnium omnis oritur, qui vacare mente putat, is ipse expers mentis habendus est." I need not here suggest what the extent and intricacy of this government is: every page of this book will serve that purpose; since the history of Creation is, itself, the history of God's government: and nothing short of absolute idiotism, rather than mere ignorance, could, as Cicero justly says, believe it possible that this incalculably complicated, multifarious, and inconceivably extended universe, could preserve its order without a government.

All the difficulties and disputes which have arisen on

this subject, relate therefore to the manner in which this government is administered, or to the exact nature of the conduct of the Deity respecting it. And, between metaphysics and theology, this has been a fertile source of disputes. A volume would not contain an account of these. I cannot here undertake to do much: and that indeed to which I am limited by my peculiar plan is, the great question, whether God actually governs in the Universe by His perpetual presence and action, or whether, having once appointed general laws for its regulation, He has committed the government to those: absenting Himself thus from it, if such a phrase may be used, or taking no further concern in what He had once arranged. This latter hypothesis, I need scarcely say, is a mode of that philosophy which is usually referred to Aristotle: though traced to a far more remote source, in the Hindoo metaphysical theology.

The present attempt, therefore, is to show, from Creation, that He does govern, personally, or immediately, by means of a constant action, or Will, ever employed: and the endeavours after that proof, form the chapters under this division. But I must here, as usual, state the *à priori* or metaphysical arguments why He ought thus to govern, as briefly as I can: while it is on this that we meet with those endless discussions, under the names of Malebranche, Leibnitz, and many more, which I scarcely dare to notice, from the initial resolution here adopted respecting opinions and authorities: whatever interest they have excited in the metaphysical world. He who chooses to write volumes, in controversy or support of other writers, is at liberty to do so: but such volumes are neither proofs nor illustrations of the Deity and His character.

In what manner theology, or rather religion, has

taken a part in this question, is even better known : but this also would lead to examinations more peculiarly out of place in a work of the present nature. If I here give the briefest possible notion of what those opinions have been, it is perhaps even more than is necessary : since the great religious question of special Providences must be known to all. And it is true also, as I formerly remarked, that religious discussions are read with little attention, and less confidence, when they proceed from the pen of a Laic, unsupported by that authority or influence which result from ecclesiastical rank and situation, or by place and name, the great arguments for right, as I have already said, with the mass of mankind.

The first *a priori* argument for the personal government of the Deity, is derived from His character, and from His conduct on other subjects. He possesses power and wisdom, which, if they were not exerted, would be as if they did not exist : and, being active when He created the Universe, whence should He be inactive now ? If we admit that God is only the animating power of nature, and admit nothing more, thus adopting that ancient theism which makes the nearest approach to what has been termed atheism, even then it may be asked with Cicero, “*Quæ autem animans natura nihil curans?*”

Again, why did He create it but because He cared for it ? and having cared then, He ought still to care, which, in Him, is to govern. The reverse would imply that mutability which we cannot admit. And if He cared for the whole, He must care for all the parts.

He is Omnipresent and Omniscient. Those would be purposeless attributes, unless they were exerted. And the Deity, at least exists. But existence without

action, is equivalent to nonexistence: and thence again He must act, or govern. Or are we, in the age of a better philosophy, to form less reasonable conclusions than those of heathen antiquity? “Dico igitur, providentia Deorum mundum et omnes mundi partes, et initio constitutas esse, et omni tempore administrari. Si concedimus intelligentes esse Deos, concedimus etiam providentes, et rerum quidem maximarum. Ergo, utrum ignorant quæ res maximæ sint, quoque hæ modo tractandæ et tuendæ? an vim non habent, quæ tantas res sustineant et gerant?”

These are enough: and I need not expand them. But an appeal has also been made to the instinctive feelings or admissions of mankind. Man cannot shake off the belief that he is governed by some superior power; and he proves this under all his conditions. He acknowledges it under all modes of religion: and even where ignorant of a Deity, or renouncing a God, his superstitions still show that he believes in a superior and mysterious government. He invents a governor and a government for himself, when he cannot see an existing one, or will not believe in the one which is proposed to him. History and biography, both, abound with proofs of this; and often, of a very peculiar nature. I presume that I need only allude to the several superstitions of nations and of individuals: while, in the latter, it is remarkable that this acknowledgment, and under this most singular form, has occurred in some of the most powerful minds on record: presenting a striking illustration of what has been termed the “credulitas infidelium.”

The continuation of the argument on this ground, is, that as our conviction of the existence of matter is, like that of our own existence, an instinctive feeling, it is,

consequently, one of God's own appointment. Therefore, the instinctive feeling respecting a superior government, must equally be of His appointment: whence, by inference from His character, the fact of that government must be true: in which sense it is a revelation, though not in words.

But if this mode of argument should merely be held to prove a government and a governor, and not the Government of that God, the Creator of the world, whose attributes have here been enumerated, the question is brought back to the previous one respecting Him; whence, of course, it has already found its answer, under that to scepticism or atheism, generally.

I may state the direct objections to the belief in this government, together with the answers, before I proceed to examine that method of reconciliation, or evasion, (since it has served both purposes,) which consists in the doctrine of general laws.

It is said, that we cannot perceive such a government, that there are no causes for the effects, and that there is the noted and admitted occurrence of chance. But chance is only that, of which we cannot trace the causes: and, not to enter on this wide question, the proposition is but the same; such chance, as our ignorance terms it, being the very mode of government in those cases where it acts: as its utility, or rather, that of our ignorance respecting the real causes and the mode of conduct, has often been demonstrated: while I have also stated this in a former chapter. We are misled also by the nature of human government. In this, everything is open, and all the dependencies are brief: the causes and the effects, both, are seen, because the connexion is close, and the means and objects limited; for want of wisdom, for want of power, and

for want of time. But, in God's government, neither of those are wanting ; and thence, the connexions escape us. The adaptations differ : but neither do those differences nor our ignorance exclude the government.

It is objected, that it is beneath the dignity of the Deity thus to govern : and this appears to have been one of the objections of most weight, as it has been a fertile source of metaphysical discussions. It should, however, be plain, that the foundation of this objection lies in an anthropomorphous Deity : and thence it does not require a very detailed answer. The obvious one is, that there was the same sacrifice of dignity in creating, as there is in governing ; and that, compared to the Infinite in dignity, all things, great or small, are equal.

I must not here enter into the dispute respecting occasional causes, and into the contests of metaphysicians on this subject ; but I may state the objection concerned in it. This is, that it is not consistent with Omnipotence and Omniscience to be the actual Governor of the universe, or, therefore, for the Deity to be the supporter and conductor of His own works. But this is only anthropomorphism in another shape : as it involves also a peculiar objection, of a metaphysical nature. If the Deity had done the reverse, or renounced the government of His creation, He would have constructed a machine of living powers, to go on without His aid, for ever ; or He would have given self-existence, and even eternity, to that which He created. This would be a voluntary self-divestment of His own power : it would not only be, to presume on a creature equal to its Creator, but that He had created His own equal : which is not admissible.

Under these discussions, it has also been objected, that

the government of the Deity must be a continued succession of miracles, as being a constant interference : which, it is said, cannot be admitted. But it ought to be plain, that this objection rests on a faultiness or confusion of definitions. A miracle is a deviation from the ordinary course of God's government, in whatever manner that is exerted: and if such government be personal and regular; it is in no respect more miraculous than the government through general laws. The exception is the only miracle, in either case.

This leads, naturally, to the only remarks which I shall make on the share that religion has taken in this dispute. The advocates for special providences presume on miracles, in every sense of that word, as thus explained. My limited business, here, is to state the dry metaphysical view of this subject ; excluding all feelings, and all impressions derived from views of revelation. If God's government be through general laws, He interferes with those, for the presumed specific purposes : if that government consists in His own regulated course of immediate, or personal action, He changes His conduct, for this occasional end.

Now, under the supposition of general laws, which are absolute by their very nature, or by the assumption itself, the objection to special Providences is perfect : since, perpetually to rescind them, would be a contradiction in terms. Under the theory of His personal and regulated government, the nature of the objection is this. He commands the wrong, or evil, first, and the remedy afterwards : which is inconsistent and self-contradictory. But if, to avoid this objectionable inference, the evil be supposed to have happened independently of His command, it becomes presumed that there is another power governing, independently of

Him, which He labours to oppose : or else, that there is a non-government, or a system of real chance, originating in, or dependent on, His negligence. This latter conclusion must be refused, from what I have already said on that subject : how far the former one differs from a system of Manicheism, has not been explained.

If I have thus stated this troublesome question, as briefly and clearly as so condensed a view of discussions not less tedious than they are often dark and confused, admits, I may now be allowed to offer the following remarks.

If we suppose, as already stated, that He governs, immediately and absolutely, He may have chosen the mode of proceeding thus objected to, that He might demonstrate to us His actual government : and while the utility of such demonstration is obvious, it might, also, not have been so well attained in any other manner. And this is that solution of the difficulty, which some metaphysical theologians, and the necessarians in particular, have contrived or thought fit to overlook. It is also evident, that this would tend to the solution of the not less tormented question respecting the efficacy of prayer; including an important subject, which I cannot here discuss : though it ought to be seen, or felt, by every one, that under the circumstances of our relation to God, or as His government concerns the moral world, this is a reasonable view ; not merely a conclusion of the feelings, from the religion of Revelation. Thus also may prayer be efficacious, notwithstanding that absolute foreknowledge and determination, on His part, which has been stated as utterly nullifying its purpose : because, knowing that such petition would be made, He may have pre-ordained to grant it, and for

that reason ; as, reversely, not to give to him that would not ask.

The only other remark which I shall make, is this. The Creator has given freewill to man, for useful or necessary purposes : and this, we can easily admit to be often opposed to His designs, or to that which His wisdom is still determined to effect. Such freewill may be viewed as the opposing principle to God's good, or intended government : or, to compare it with the Manichean hypothesis, it becomes the Evil principle of that system. But it does not follow that He must have given this liberty, to such an extent as to evade or oppose His own power, and thus to defeat entirely His great plans : in which case, His interference through special Providences, would become the obvious remedy. But I must here drop this subject, and return.

I am probably not wrong in supposing, that the real, or at least the predominant source of the hypothesis of general laws, has been the desire to exclude the Deity altogether : and that it has often been adopted, from an atheistical philosophy, by men who did not perceive its connexions, or conjecture its origin : following, as usual, from habit, and without examination or reflection, those ancient hypotheses which have infected modern philosophy so widely and durably, on other points which I have repeatedly had occasion to notice. It is plain, that general laws, taken in an absolute sense, form a species of modified Atheism : and when Cudworth, as I formerly remarked, adopted his hypothesis of a plastic Nature, the habit of investigating the Greek philosophy seems to have influenced his mind, apparently under perfect innocence of such a system, in this very manner. If a spirit of a worse kind towards the Deity has occasionally prevailed, so as to produce this belief, it

would be as little charitable to inquire of it here, as it would be misplaced in such an investigation.

To pass, therefore, from this, it is needful, in the first place, to inquire into the meaning of the term, or phrase, General laws, though I have had occasion to notice that doctrine in former parts of this work. This has been mis-apprehended, and consequently, mis-applied, from confounding rules, as the general expression for a mass of facts, similar or connected, with laws, in the ordinary meaning of that word. Hence we may trace, in some philosophers at least, that system called atheistical, just noticed, which denies the direct Government of the Deity, and presumes on His retirement, or repose. A rule, or a law, in the sense of metaphysical theology, is the order or system of actions which wisdom has appointed to conduct its plans, or its machinery: or it is the general principle to which separate actions are referable. Laws, in the ordinary sense, are rules for the conduct of agents empowered to act by themselves: if the intelligence dictates a rule or law to man, it is his power which executes, as a free agent.

Now this cannot happen in the case of matter, or in the physical creation. There is no power to execute. He who made the law must also execute it: there is nothing to do this, unless matter were intelligent and active: and hence the Deity must still act in the conduct of the universe, notwithstanding His laws, or "the laws of Nature." There would otherwise follow "absurd" conclusion, that matter can listen to laws, remember them, and obey them. This would be, either to give mind to matter, which is a confounding of definitions, or, to assume mind and matter as one thing, or as in eternal and necessary union, which is

another "absurdity" of the same nature. Thus also, it may be asked, in what way could matter, as an agent, know those laws, when not called into existence, or at least into arrangement and action, till long after their promulgation. The present animal machine, for example, was created yesterday, and it works by laws which, according to the hypothesis, were made from eternity. This cannot be: and therefore the Creator gives those laws, or rules of action, daily: and thence He governs even as if He executed with His own "hand."

Thus, in a just sense, the "laws of nature" can signify nothing more than the Deity's plan and mode of acting: and, if they are constant, it is only because He acts uniformly, not because He once appointed them, and then gave up the government. That those laws are fixed in any specific case, and their actions steady and certain, cannot prove a delegation to themselves: they are such, because His plan was fixed in wisdom; and were they otherwise, it would follow that He was vacillatory, or deficient in power: which is impossible. Or, to use the phraseology of some metaphysicians, the laws of nature are the conduct of the Deity prescribed to Him by Himself. If therefore this phrase has been used to supersede the government and action of the Deity, it has arisen from a confusion of thought, or of terms, when it has not had another source.

But, in reality, the "laws of nature" are not thus fixed and constant; and they who have assumed this, have overlooked some of the most familiar facts in creation, as I have pointed out on former occasions. An animal varies from the general rule of its structure, by being born deformed; and a doubled flower, or a variety in a plant, is produced, and propagated, through

seeds that equally break the general laws prescribed to their species. The system then which presumes on "laws" appointed from the beginning, under any mode of conduct in the Deity, cannot explain this, unless it concludes that effects can happen without a cause, or that there is some designing and active power which is not God.

If I had here undertaken to examine opinions and authorities, which I have, on the contrary, decided to avoid, I might have occupied some space on Descartes and Leibnitz ; the former of whom considers the universe as a machine put into action by one original impressed motion, as the latter enhances on this hypothesis. The attempt to support this opinion by physical reasoning, was unfortunate ; and thence alone does it deserve a remark. Under the generalities of metaphysics, this speculation was comparatively safe : while it was but another mode of stating the usual hypothesis. And the result should be a caution to metaphysics, not to transgress those shadowy bounds which form their security, as they surround the votaries with a mist which obfuscates while it imprisons. When Descartes stated that the same quantity of motion was always existent in the universe, he had forgotten, as a mathematician, that this was not true ; and was ignorant of that chemistry which affords an overwhelming answer. When also the universe was compared to a human machine, it was not recollected that such machines can move but through a foreign impelling power, perpetually acting. The very force which moves a clock, is the Hand of the Deity.

This should suffice as to the general question of God's government. But as the mode of that government concerns the investigations of philosophy most

essentially, I must be allowed to add a few remarks on that question which has so frequently occurred throughout these pages. It is the well-known question of secondary causes : so often erected into the ultimate or primary ones, under the phrase, " laws of nature."

Ignorance, and piety, equally, form a true opinion, when they refer everything in the course of nature to the power and government of God : but this is not a conclusion from facts, it is an inference from premises. Pure ignorance, believing in a Deity, cuts all short, by referring, directly and immediately, to the Prime Cause ; which is inferred, perhaps through habit or example, perhaps also through a prime instinctive feeling. Piety does no more, unless it be enlightened by philosophy : yet its grounds may be different, as they may consist in a knowledge of Revelation, or possibly, be founded on the doctrines of natural religion. And if pure ignorance thinks not of secondary causes, or, being vain, as such ignorance frequently is, rejects them, so does piety often act in the same manner, sometimes from defective knowledge, at others from mistaken views of its duties. And though that piety which especially attaches itself to Revelation, is there taught to study God in His works, it not only is apt to reject secondary causes, but to censure the philosophy which inquires of them. Ignorant and false views of Scripture more easily adopt the same course : and it is, for obvious reasons, often a widely popular one ; flattering the uninformed and the indolent, by maintaining that to be unnecessary which they cannot or will not acquire, and pleasing them with the fancied satisfaction of contemning those whom they cannot equal, or of professedly despising what is secretly envied. If this be piety, it ought not at least to forget, that the employment of

secondary causes is declared all throughout Scripture, as it may often be inferred where not declared, and that the general principle, at least, is established.

If any one has, in this case, been influenced by the fact, that the doctrine of secondary causes, or general laws, has been abused, it is still true that there has been much of neglect, as well as of design, on the part of philosophy ; of oblivion, or negligence, I may call it : while, in other cases, the cause has been an unwillingness, whether judicious or not, I need not now ask, to intermix moral questions with physical inquiries. All this, at least, is pardonable : if evil follows, it was not intended : while if there are persons who have turned the inquiry into secondary causes to designedly evil purposes, a sound and a true philosophy disclaims them.

A just philosophy sees, admits, and proves, that whatever secondary causes exist, they are the agents of the Deity : and thus it comes to the same conclusion as the ignorant, and as the pious under whatever modifications. But let it not be forgotten, that its judgment is of a very different quality ; that its conclusions are more sound and secure, while its piety is not less. To borrow a scriptural phraseology, this is the philosophy which can show a reason for its belief. And these are men also, who have done their duty ; as having used the gift of God, their reason and their talents, in illustrating Him and discovering His ways ; while not forgetting that this is a command enforced on them by a direct revelation of promises and denunciations. "The heavens declare the glory of God :" but it is entrusted to man, under the commands of his Creator, to explain how they declare it. No combination of ignorance and piety alone can do this. The piety of the chosen of God attempted it through this very road : and he

must be ill read in the Scriptures who does not perceive this everywhere.

But the study of secondary causes, if it is philosophy in a purely human view, or for the exercise of man's intellect and the uses of man, is also philosophy as to the Deity. God does not place His hand on matter, and move it: it belongs to piety and philosophy equally, to inquire how He effects His purposes; how the universal and incomprehensible Spirit, the invisible and the intangible mover of the universe, performs, through His mere will, what man must do by that weak and narrowed hand which has been entrusted with a limited command over matter. This is the investigation of secondary causes; and it is philosophy. It is philosophy, in the narrowest sense; for it is to trace effects to causes, and through chains of causes: it is philosophy in the noblest one; for it is the attempt to trace all to the Deity himself. Philosophy desires not to stop: its very business is to proceed, and from cause to cause. The Creator himself has so commanded: for He has given the insuperable desire, the uncontrollable instinct.

And the chain was to end in God. Man has not carried it thither: rather, he knows not that he has ever done so, or that he ever can. And it is right that he should not know it: for this is not only his pursuit and his pleasure, but his education. By this he learns to feel God, as he thus pursues Him for ever: by this he ever hopes to know Him better; and, in this hope and pursuit, does he improve in that knowledge; learning better, by every new step which he makes, the power, and the wisdom, and the conduct, of the great Governor of the universe. Let him be stopped in his career where he may, he still knows that God is beyond

him, the cause of all, the mover of all : should he advance a step further, he has discovered one link more in the chain which unites creation to its Ruler. The remaining links may be many : yet these are his pursuit, and to surmount but one step, is to add to the dignity of man as the creature of God, and to have continued in his duty as that creature ; while he still, for ever, sees before him, that object which he ever approaches, though he may never reach it, the great First Cause.

For the human purposes of philosophy, man's duty and pursuit are the same : and who will question that this also is of the Creator's commands ? God has conceded to him a portion of His own power over matter. He cannot indeed will, and say, "It is good." But he has been empowered to trace the means through which the Divine hand acts, and, when he has found them, that Hand is given to him, to dispose of and to use. It is not too bold an expression to say, that man calls down the Creator of the universe from His "heaven of heavens" to act for him : for thus did that Creator will, when He gave to man the power of discovering and of applying secondary causes. And this is the study of secondary causes, this is philosophy : it is the gift of God to man ; the gift of His bounty for man's uses, an order, from His wisdom and His authority, that man may learn to know Him : His goodness and His command united.

After this, it can scarcely be necessary to state, in the mere usual language of philosophy, what philosophy is ; and what that is, without which it could have no existence. It is the perpetual tracing of causes, or apparent causes, in succession : in the phraseology of science, it is a generalization ; and, without the govern-

ment of secondary causes, there is no science. But hence, finally, becomes visible the ignorance and the narrowness of mind, which would exclude human reason, and the investigation into the works and ways of the Deity, from religion ; which conceive, or speak of, philosophy, as if it were at variance with the knowledge of God. Far other indeed than this, is the truth. It is that foundation of religion and piety, which no opinions, or systems, or disputes, can ever shake ; for this foundation is in God himself, durable as His manifestations of Himself are everlasting, and true as truth can be, since our power of knowing Him through His ways has been given to us by the God of truth.

If I stated, at the beginning of this general sketch, that the chapters under this division attempt to infer the direct, or immediate, government of the Deity in the physical universe, I ought also to state the mode of proof which has been adopted. When brought to its simple analysis, it is to show, or else to suggest, either that we have arrived at the last assignable secondary cause, or that there is none ; in either of which cases, we are brought into contact with the First Cause, or the immediate hand of God. I state it thus, at once, in the most open manner ; lest I should be supposed to have disguised the truth among the details, or, lest possibly, it should be thought that I had not apprehended the metaphysical nature of my own statements. On this difficult fact to infer, or prove, the conclusion must necessarily rest. I admit that the adduced cases are of unequal force ; as some of them also are rather suggestions for inquiry : but if I have succeeded in showing that there are any facts in Creation which cannot be explained by means of a secondary cause, it is to have brought the hand of the Deity into immediate

contact with His workings. And this is the proof of His personal government in the physical world: while that proof would be equally complete, though there were but a single instance in which this could be done. I may state, in the briefest manner, an example of this mode of induction, though I must restate it more fully hereafter. The reader might not else see the clue which is to guide him through the following details, till he had arrived towards their termination.

Gravity is a cause of motion, and cannot be a property of matter; because, to commence motion requires power which implies volition, and therefore, mind: The conclusion is axiomatic, or instinctive; depending on the fact that we know of our own mind through the same power. If it be objected, that this property, or power, might have been given to it at the creation, the metaphysical answer is, that it is then no longer matter. But even granting matter and power to be thus united, the compound must also have the faculty of thought. It must choose, and will, as, without this, the tendencies and adjustments of gravitation could not take place as they do; while it must, equally, know the sizes and distances of the bodies on which it acts, or possess knowledge, because the results are results of knowledge. As this cannot be conceived, or admitted, the conclusion is, that beyond the act, or force, of gravitation, no prior secondary cause being proveable, the hand of the Deity has been brought into contact with the effect: and this is His government. To infer otherwise, is to adopt the hypothesis of a mind in the universe which is not the Deity: an ancient philosophy, under the forms of a materialism and an atheism: as it has been a modern one, under various modifications, for

which the reader may consult Maupertuis and Kepler ; and even Monboddo, with others.

If the physical, personal government of the Deity is thus proved, His moral one is inferred through a short train of reasoning, which I may even place in a syllogistic form. The physical universe was provided for the purposes of the moral one. He who governs the former, will, of necessity, govern the latter, as far as that depends on it : while there is the further obvious inference, that it would be an “absurd” conclusion to assert that He who attended to the means should neglect the end.

And the consideration of a moral government, or Providence, brings me, of necessity, to the question of religion : while though I declined this subject where it involved disputation, I need not now refrain from a few of the obvious remarks to which it gives rise.

In a philosophical and abstract view, Religion is the science of the existence of the Creator, and of His conduct as to His creation. If there is a Creator, there must be a conduct ; because to suppose creation without any subsequent conduct respecting it, is to suppose action without motives ; or its equivalent. Such conduct is government : and that government is providence, inasmuch as it is concernment and care ; while there can be no care which is not prospective as well as present. There can therefore be no religion where the government or providence of God is denied. They are identical assumptions ; or, if the first be admitted, identical facts. He therefore who denies a Providence, will be deemed atheistical by those who consider it atheism to be without belief in religion, or in a connexion between God and His creation. In a practical

view, Religion consists, first, in a knowledge of our duties to the Creator, and further, to man, under obedience to His laws; secondly in the performance of those duties. To pretend, therefore, to believe in the theory of practical religion, or in the propriety and utility of a knowledge of God and our duties, and at the same time to doubt His providence, is a contradiction: while it is plainly impossible to put that theory into practice, or to be religious in conduct, under a denial or doubt of God's providence. It is truly therefore said, in much briefer terms, that to deny the providence of God is to renounce religion: and even thus has reasoned the ancient philosopher whom I have already quoted. "Sin autem dii neque possunt nos juvare neque volunt, nec omnino curant, nec quid agamus animadvertisunt, nec est quod ab his ad hominum vitam permanare possit, quid est quod ullos diis immortalibus cultus, honores, preces adhibeamus?" "cum quibus, simul et sanctitatem et religionem tolli necesse est; quibus sublatis perturbatio vitæ sequitur, et magna confusio."

To doubt of the Divine government of the world, must be, to every thinking mind, a source of anxiety if not of fear: it is, at least, to extinguish all confidence, and even all hope as to the events of life. I need not point out the evils implied in the two former passions: while, to be without hope, is to be without an active interest in the world, as its extreme is despair; of all misery the most intolerable.

The question of a providence may also be placed on the ground of expediency. Is the government of the Deity desirable, or the reverse? is it better that there be a God than none? We must inquire how far we are personally concerned in this case. We are subject

to physical and moral evils : and the sum of evil is very great, notwithstanding the good. Against all this, we are often powerless. Supposing now that this question related to a human government, would we rather possess one, or be without it ? Were there none, a wise man would wish for one. It would be a comfort, a dependence, an ultimate resource : in evil we should look forward to some end ; to a compensation, or a reparation, or at least to an explanation. In the meantime, there is reliance, or hope, which is an advantage : or there may be absolute confidence : as is the case with the pious, under a belief in the Divine government. If the government be a just one, there is an especial security, when it depends on ourselves to obtain the compensation or remedy. If it be a mild, or beneficent one, our wish to be under it should be still greater : if, with these, it is also a powerful government, the security is absolute.

Yet this, or such as this in some manner, must be the government of God. It is true that we still suffer under it : yet though any should thence believe it to be imperfect, that is not a reason for rejection, because it would not be a reason under a human government. And to do so, is also incongruous with our ordinary conduct. Supposing it to be doubtful, there is at least some evidence, or there is a considerable probability of the existence of such a government : and we accept of consolation, every day, from probabilities or possibilities not greater : as we even adopt admitted fictions for the same purpose.

The appeal therefore, in favour of a Providence, becomes an appeal, conjointly, to our reason, to our passions, and to our current conduct. We ought to believe in it, on philosophical grounds ; first, through *a priori*

reasonings respecting God, and next, from the facts of Creation which imply the indispensable necessity of His government. We ought to believe in it, because of the useful results of this belief, and because we believe many less probable things than this, and on inferior evidence.

But we ought to believe in it also, because it is the safest side to adopt, even supposing that we should consider it a doubtful fact. Thus to believe is attended by neither evil nor hazard: to reject the Divine government, may possibly involve both. This belief, I have suggested, may produce happiness: we have experience that it does so: but, when the Divine government is rightly viewed and felt, we can discover no misery that should follow from believing in it. And to these views of expediency, or reasonableness, I may add the following. If goodness, or virtue, be of value to the possessor himself, or to mankind, we ought to believe in the government of God: because, while His will, however discovered or known, is the source of all virtue, His government is its sanction. The appeal ought not to be in vain.

CHAPTER LIII.

ON THE LIMITATIONS OF ANIMALS.

THE whole universe is a mass of motion : senseless or living, everything is for ever performing its appointed movements. Obvious sources of prejudice have indeed accustomed us to consider matter as at rest : but philosophy corrects this. There is no such thing : there is no rest in the universe, as chemistry knows. If motion is the life of the great world of orbs, so is it a life in the infinitesimals of its similarly insensible components. In the former, the mysterious principle of attraction regulates those great motions respecting which we can never infer a period of rest. In the latter, the moving powers are similarly regulated : there is a perpetual balancing of forces for designed ends, and all these, all ends, are for ever attained. The facts are the same in the organic creation. In both departments of this, the motions of chemistry rule the vital actions : being themselves ruled by that life which is in the hands of the Creator. And all this is equally under the government of God : it is His physical government of the universe.

But in the animal department of life, the power of locomotion, under will, is superadded. The effects, indeed, are physical : I may compare them to the centrifugal movements of the planets : there is sufficient

resemblance ; the rest is identity. The world of animals, like the world of orbs, is a mass of motion ; but the causes are moral. This is the question which concerns us at present : the nature of the physical government of the universe must already have appeared : this regards the moral government of God.

The earth is full of life : the beneficence of the Creator has crowded it with plants and animals. But the places of the former have been fixed, under various relations, to the terrestrial surface ; and they are limited by their immobility : they require no political government to maintain their order. It is not so with the animal races. They are furnished with desires, gifted with will, and provided with powers to move and to wander as they please : while they are ever also in motion. Why do they not roam throughout the world : why is there not interference, dissension, war : how is it that there is order, whence peace ; and how is it too that we find them limited to the places to which they were appointed ? We know that their Governor is indeed one of no ordinary wisdom and power : but in what manner does He govern this various, endless, restless, discordant multitude of wills ; of beings that acknowledge no earthly kings, no governments, no laws ? This is the question, of which I have to inquire : for, as usual, we forget to note the familiar fact, as, much more have we forgotten to inquire of the government. It is the order of the universe : it has ever been the same : whence should it be otherwise ? The philosopher, he who, seeing and thinking, infers thus, is the blameworthy person which he has often been called : he who concludes thus, under a neglectful ignorance, must find his own defence.

In the great universe, the principle of attraction re-

gulates all the motions, and preserves order. It is a law, because it is constant and unvarying, and because it is obeyed. This is the term ; but it is one which in satisfying the ear, too often imposes on the understanding. Be the facts what they may, we trace nothing beyond them ; no cause but the lawgiver Himself : the immediate will of the Creator governs everything and performs everything : there is no will interposed, nor do we know of any intermediate power.

But, unlike those, the motions in the living and moving world of animals have been placed under the command of intermediate and subsidiary wills. He indeed governs equally ; all are under His will ; but He does not govern directly. There could be no mathematical law, as in the wide universe of celestial spheres, for the distribution, the regulation, and the restraint of this great mass of motions, thus divided among uncountable multitudes of discordant bodies. Nor is there any centripetal force to preserve order in these various centrifugal movements ; for no one law would have sufficed : they do not even obey any apparent rule, or any number of visible rules. Yet the total order of the whole mass goes on as it has done from the first, even under perpetual changes in the absolute quantity of that motion and the modes of its distribution, consequent on ever varying numbers and ever changing balances among the species.

This was the problem to be solved. It was to distribute and regulate every independent part of this great mass of motions, under all changes, for the desired end, the order of creation ; for a system of good government, of universal happiness under universal justice. Who is there, knowing the elements, that will say it was possible ? Yet this problem is solved.

There is not even an appearance of restraint, no force, no command : while amid endless diversities, in everything, the intended results are attained in every year and every generation, and in every part of the earth, as they have been from the beginning and will continue to the end.

But this is not the sole problem that was to be solved, and that has been solved. The powers are various and great : there is sufficient power to derange everything. There is no apparent restraint on the wills ; the appearance of liberty is entire. But it is more than this ; there is perfect free-will ; since freedom is absolute, when all the wishes can be gratified. Every animal can do whatever it desires : there can be no greater liberty than this.

Why then do they not rebel, why does not the whole mass rebel, and throw the government into confusion ? Where is the power that controuls these forces, I said ? but what is that power which restrains this mass and multitude of wills, and directs them all to its own fixed purposes, so that every individual body in this living universe is in its place, and performs what was intended, though all are free to act as they please ? He has commanded that they shall not desire to do wrong : the wishes themselves are bounded, restrained, and directed : and thus, without force or pain, without infringing on perfect happiness, He for ever rules a mass of willing and moving bodies, more difficult to govern than the very stars ; thus maintaining the perpetual order of His policy and His dominions. To govern minds, is indeed to govern in wisdom and power : what is there in the physical government of the universe that shall be compared to the moral one ? But to govern in beneficence, as He here does, belongs

truly to Him alone. And who, what, else, could have performed the very least of this? Chance, assuredly, never did it once: though if there is aught in creation which seems under this imaginary dominion, we might expect it in the multitudinous motions of animal life.

Before inquiring of the means which appear to have been adopted for the political government of the earth, it is requisite to ask what kind of order in creation was to be preserved, what the specific nature and purposes of the limitations of animals are. If animals had wandered at will, all over the world, the necessary and useful system of balances, described in the next chapter, could not have existed; the laws for limitations form one of the main foundations of this part of the total political government, whatever further purposes they serve. Thus the system for feeding the animal creation, which is the great and ultimate end of all this government, must have been equally impracticable; as, especially, that portion of it which consists in the arrangements for a certain order of prey, could not have been executed. But man also is one of the subjects under this government: being indeed the most important object of it, as he is the least controlled: allowed the free range of the whole earth, yet not permitted to wander through the sea and the air, with the fishes and the birds; and allowed also to interfere with every animal, though not many are suffered to infringe on his superior and ordained rights. And a large part of his secure possession of those, depends on the limitations appointed for the rest of the creation. Under their universal freedom, he would have lost his needful command over them: he could have formed and preserved no system for governing them, or for regulating himself: he would have been the prey to hosts, the

monarch of rebels and enemies ; they might even have gained the mastery, and driven him out of creation. The locust alone might do this to-morrow : but the subject over which he has no power, is the subject of a government superior to his own, regulating for all, as it regulates for him.

Similar evil effects, with others, would have followed from a licence far less than this universal freedom, and from motions far more narrowed than those which might have brought them all from the regions of cold and scantiness, to the warmth and abundance of the better portions of the earth. If, in this case, they would have left food to waste in one part of the world, while they were overwhelming it in another, to their own injury, and to the defeating of the Creator's design to replenish the earth, the same bad consequences would have resulted from much more slender irregularities in movement and interferences in place ; as they do at present, whenever a breach of the established order is committed. The derangement of the system of feeding would scarcely have been less : the replenishment of the earth could not have been what it is ; and man would have suffered under nearly equal annoyances. But this would not have been the boundary of the disorder. The predatory, and the powerful, and the mischievous, would have destroyed wherever they pleased, instead of obeying those strict commands under which regularity, plenty, and peace, are now preserved. The bulky, the voracious, and the strong, would have consumed and destroyed the food of the feeble and the small ; the mutual checks by which order is preserved among the predatory would have failed ; the smaller balances of the several parts, which form the aggregate of this needful and useful order, could not have existed :

while the further result would have been universal interference : oppression, resistance, perpetual warfare, the dissolution of the society, final destruction.

Thus complicated does God's government for His world of animals appear to be. The fulness of the earth, the feeding of its multitudes, the peace that reigns among these discordant myriads, under a limited and ordained warfare, the balances among the several kinds, the changes of those, the order of man's races, his extension in power and place and wealth and numbers, his deputed government over this living creation, all depend on the limitations prescribed to animals ; as these again are regulated by the order appointed to vegetables, and, beyond this, by that one which is established for the earth, both within itself, and as a portion of the planetary system. More justly viewed however, everything depends on every other, as far as the living multitudes are concerned : it is a continued chain of mutual dependence and entanglement : but it is still the unity of God's perfect government, working to one great end. I have already asked whether it was an easy problem to solve, whether this government was an easy one to plan and to administer : the difficulties will now have been rendered more apparent.

We are thus also better prepared to examine the means by which He affects that portion of the whole order which is the subject here under review. If theology and metaphysics, if philosophy, had been more cultivated by writers on natural history, their works might have furnished the information which they do not, on this subject : this is not the manner in which they have viewed the world of animals. I do not presume that I have here named all the means in use, or that the actions of these apparent ones are understood :

but he who shall "discover" what all can see, that this extensive and complicated government has not been here justly or satisfactorily explained, can try the less difficult task of analyzing the political construction of any human government that he may choose, and the working of the several parts under it.

As far as I can perceive these means, or the causes appointed for the limitation of animals, they are the following ; and they are divisible into the physical, and absolutely restraining forces, and into the moral ones, which consist in regulating their inclinations. The beauty and beneficence of this last set of laws, I have already pointed out : but this conclusion is not less true as regards the former. There is no suffering under a consciousness of restraint, or of the want of entire freedom ; except perhaps in the single case where the dread of man is a source of limitation. The animal which is controlled by the shortness of its life, is ignorant of that brevity ; that which its minuteness or feebleness checks, finds power enough to attain all its desires ; and it is only in fable, that the beast longs for the wings of the bird, or the fish would fain ascend to the clouds.

The physical causes, then, of restraint, consist in the peculiar constructions of classes and of species in animals, in minuteness, or in deficiency of muscular force; and in the brevity or circumscription of life. The dread of man is not a physical cause; but being a positive check, as it is the only one under which the will is constrained, it must rank here. Climate operates partly as a positive force, and partly as a moral inducement : while the gregarious principle, the love of indolence, the instinct of local attachment, the desire for breeding in some specific manner, and a choice for some particu-

lar kinds of food, seem to include all those restraints which, to the animal itself, appear to depend on its own free-will ; as, in reality, all the rest do, equally.

The two great limitations under construction, are to the land and the water, under a great variety of minor regulations for the same end. With the well-known exceptions which I need not here specify, neither division of animals can infringe on the dominions of the other ; nor, under similar exceptions, can either occupy the air.. Enabled to travel the air, without being ever excluded from the land, and only in part from the waters, the birds possess at least that security, from their peculiar powers, which prevents the other divisions from interfering with them ; under the exceptions, as usual, from which no arrangement in nature seems exempt. These, then, are three great systems of limitation from construction ; more or less perfect, as they are the basis of many inferior ones. In the terrene division, a former account of the modes of motion in animals, has shown how their several forms and structures tie them down within certain bounds ; though the force is visible only to us, since all desire to do what they perform, and prefer the places to which they are imprisoned, as they were destined. Thus is the Sloth confined to its trees, as the Rabbit is to the sandy ground in which it can burrow ; thus is the Mole banished from the surface ; and thus are the Camel and the Goat separated by their respective sands and rocks, since neither can tread the soil destined for the other. Hence also must the Seal adhere to the sea, while the Manati cannot leave it : as, in the ocean itself, the flat-fishes are confined to the bottom, the Lumbricus, like the mole, to the sands, and the Whale to the deep waters. And it is the same in the birds. The divers

are limited, even as the Seals are: the Sparrow could not inhabit with the Rook, nor the Rook swim the waters with the Gull.

Thus also, do constructions aid in producing a nocturnal, instead of a diurnal life: laying the foundation of another great department of limitations. I have said, aid; but, in reality, there is no case where a single cause acts in producing the effects in question, as will be fully evident hereafter. It is not that one cause might not have been efficient, but because the inclinations, whether to food, repose, place, or whatever else, have been made to correspond with those, that the desires might be gratified, in the attainment of those objects; so that although the mere construction is often an effectual source of limitation, it does not always appear to be the acting cause, and is seldom really such. This remark I need not repeat; it applies universally: and here also I may observe, once for all, that as full illustrations would include the whole history of the animal creation, I must be equally brief throughout, leaving it to the reader to add whatever happens to be in his power, as thus also he will better learn to see and understand this subject.

The incapacity for aught but limited motions operates extensively as a check, in the smaller animals and the lower orders of creation. The shell-fishes are almost rooted to the soils where they were produced: the corals are as vegetables in this respect. The Creator has here drawn the line with His own hands; and He has left neither power nor will to infringe it. The Medusa is free of the waters; but its journeyings are circumscribed by that feebleness and tardiness of motion which restrain it where it may be found by those for whose food it was appointed. It is an example of

a limitation which is again to form the limitations of others: thus involved is everything in this wide and wonderful government. The larvæ of insects can move as far as is useful to themselves; but they must not wander wide. They must not destroy all those supplies for others, which a greater power of motion would have given them; and, like the Medusa, they are required for other purposes than their own. The sluggish Chameleon is tied to its tree: it might not have injured others, but, under greater liberty, it might have left its own means of existence behind, and it might have become an unresisting prey to the stronger. The laws in this government are not all made for preventing the subjects from injuring each other: it is ordained that they shall not even injure themselves; and the meanest, like the highest, are to be protected. In the smaller quadrupeds and birds, as in far more among the inferior tribes, the sources of limitation are the same, as the purposes are similar: security of food, protection against injury or destruction, restriction on the powers of injuring, order, peace, justice. The tardy and blind Mole must remain with its worms; it shall not wander in the territories of the Fox; the Weasel shall not destroy the sleeping Horse. If there are migrations and breaking of bounds, even here, they have been commanded for special purposes: if there is hazard, even under powers so limited, some other check is appointed, and the order of the government is preserved. The migrating caterpillar journies, that its visible columns may supply the wants of the birds, and that its ravages may be terminated: the awkward frog might wander more widely; but it will not quit the water in which it has been ordered to delight.

It is in the insect races that the limitations produced

by the brief duration of life are most conspicuous ; though other causes unite, here as elsewhere, in the production of the intended effects. The animal which has but a few weeks, or days, or hours, to live, must lay its eggs, in conformity to its orders, in the place where it was born ; and thus the progeny takes the place of the parent, to renew the same round. Where particular exceptions occur, as in the Locust and other migrating insects, there is a special intention for a designed end ; as this sometimes is the regulation of numbers through a process of self-destruction. And here it is that we are perhaps best taught to feel the value of that government which we had overlooked : seeing one inconvenience, we may become sensible of the evils which would follow, if those exceptions to the general order and repose were frequent, still more if the laws of restraint were revoked. This indeed never strikes us : it scarcely occurs even to the minds of the observant and reflecting. We are so used to the steady order of Creation, that while it seems to be an uncaused thing, a necessity of the universe, we never imagine the possibility of its being broken, nor think of the consequences, even when they are forced on us by the arrival of the Locust or the importation of the apple Aphis, the Cockroach, and the red Ant. In all legislation alike, it is the crime which opens men's eyes to the value of the law : and the brown Rat at least should teach us what would follow, if the same license were extended to all the animal races. I gladly point out these exceptions, because they have a moral value ; since it is the perfection of God's government which makes us overlook or deny it. The possible extent of this evil will be better judged of, in perusing the following chapter. The balances of animals are aggre-

gates of their limitations ; and the evils here detailed arise from destroying, through commerce, or other means, those appointed balances which constitute so large a portion of the total government ; as a further infringement of them might ultimately involve universal disorder.

The dread of man is that cause of limitation in animals, which is, above all the rest, connected with his existence and interests, as he forms one of the subjects of this government. All the other laws for restraint, are intended for universal peace, but for a peace that was to exist though he had never been born on the earth : the present refers to that power which was given him, when it was announced to him that he should rule. Every other law concerns him as it concerns all : but this one was designed that his races should extend, even to the entire occupation of the world : to the profiting by all, as to the exclusion of all that might interfere with him, the prime care of the Creator. And its operation we trace everywhere : in the curtailment of the range of the Lion, and, adding power to the influence of fear, in the restrictions, extending to almost the extinctions, of the races which he desires to exclude, and which he often unintentionally excludes, in his avarice to profit by them. But it is sufficient that I here state briefly what will find a better place in the following chapter. That it is a law under which the other animals of creation suffer, I need not repeat ; but it is the only one : and it is, here as elsewhere, a rule of God's government, that good consequences should be produced through partial evils.

As far as limitation is produced by climate, it is the result of physical force, in the hotter ones at least : there is a positive law for this end, which renders the

animal incapable of enduring another. But there is no suffering except under a breach of the law ; it is the allotted punishment of crime : while there is not merely a desire to obey, but the obedience itself is a pleasure. It would be well for the world, if this were the case more widely. It is true however in practice, that many of the apparent limitations to climate are produced by food ; the real localization being that of the plant : but so little is here trusted to one cause, that they cannot be separated, in examining the results. But if in thus noting the hot climates especially, my object was to infer that this law of limitation was a beneficent one for the animal itself, the intention of the Creator is very strikingly confirmed by the instance of the polar Bear, because the desire is an exception to the general course of desires : this animal prefers its cold snows and wet ice, even as the Rhinoceros delights in its hot and steaming mud. If there are animals without limit of climate, such as the Snipe and the Fox, it is only that these are specific exceptions under other purposes ; while the order is otherwise regulated with equivalent general effects. Under this head, the illustrations which might be adduced are so well known, that any one can supply them. How far the limitations can be broken by man, for his own purposes, I formerly inquired.

The politico-social, and the gregarious principles, in animals, may be united as a cause of limitation, though there is some difference in their actions : while the most striking effect of both is to produce order within narrow boundaries. To be united in one work and one interest, as the former are, is to establish independent states ; cities by which the communities are separated : while, as being the homes, they are centres to regulate the limits that are to bound the wanderings.

of these populations. Thus also is peace preserved, where there are no rivalries to produce war, or where the instinct of warfare has been withheld, in aid of the Creator's system of government. When this is permitted, for whatever good purpose, as in the wars for plunder, waged by the Wasp and the Hornet upon the cities of the Bees, the exception serves to show us at least what the disorder would be if this restriction were removed, or if the love of war were to be made universal. The very remarkable exception in the war-making Ants may lead to the same reflection: since, under our present ignorance of its purposes, it can produce no others.

And the instinct, or love, of peace demands a more pointed notice; since it is one of the means appointed by the Creator for the management of this great government: though I could not well have included it among the causes of limitation. The system of prey is war; but it is established for indispensable purposes; as, in every known case of more general warfare, food is the object, in some manner; with, I believe, the single exception just noticed, where there is an acquisition, however, to be made, though we do not well see its necessity. But there is no warfare merely because there is the power; from cruelty, or the love of mischief, or for territory where there may be interference; as I need not say there is none under any of the usual human motives: while even the predaceous animals, to which war is a habit, cease to attack if they are supplied with food: thus even residing with each other, or with their usual prey, in tranquillity and harmony. Except in the familiar instance of the Cat, in those of the Wolf and the Dog, destroying more sheep than they can devour, and in that of the Peacock, killing the chickens

within its reach, I am not aware of any examples of wanton injury : while these last cases might possibly admit of another solution. And if such war is rare, or almost unknown, it is not for want of strength, and powers of offence, nor for want of what we ignorantly term ferocity, since there is no ferocity except for ordained useful purposes: while the habit alone should, in the warring animals, lead us to expect perpetual and wanton warfare. Nor is it for want of the principle of military order and command, in the gregarious animals; since the Rams might attack, as they defend, and the master Stag, leading its formidable ranks and files with all the precision of a battalion, might drive all the other animals from its pastures, under a very obvious motive, did it do no more. But the Creator has implanted in all animals the love of peace, or has deprived them of that inclination for mere war which He has allowed to man. Wherever this instinct is given, or the practice permitted, the useful purposes are well known ; as, among these, the most important under the present view, is the acquisition of monarchical power, for the sake of this very object, peace, through obedience. If there are casual quarrels among individuals, as is common among the lively and irritable birds, they are not such as to produce any disturbance of the established order, as, in other cases, the sources of contest among the birds, whether pairing or polyamous, are well known, as are the useful results.

Of the order resulting from the joint effects of political associations and the love of peace, the sea birds often present striking examples. Where many kinds inhabit one rock, as is usual, each has its place and its boundary; closely as these several states are brought into contact. There is neither intrusion, nor interference, nor war-

fare, though they are neighbours, and rival nations, pursuing their only wealth, food, in the same place. They are ever meeting, on the sea with their fleets, in the air with their armies ; there is abundant power, with very unequal means of offence, and often under very unequal numbers ; yet there is no attempt at conquest, no endeavour on the part of the strong to drive the weak from their territories, or to deprive them of their equal rights over the wealth which was given for all. Such it is to obey the laws which united wisdom and goodness have issued : such it would be to obey Him who might enforce where He solicits, and who is not obeyed because He has not chosen to compel obedience : since thus is it that these states are established in peace, and permanent as the very rocks which form their territories. Here also is the effect of the gregarious principle, in the preservation of order, peculiarly visible, from the constant and close proximity of these different tribes ; though it may be observed all through creation. The very region in the air is defined for each : the wide fields in which these several armies are drawn up, are without mark or boundary : the walls are but the invisible and yielding element which the wandering feather breaks through ; but their Creator has said to them, that feather may pass, but you must not ; to you it is a wall of brass.

It is evident that a principle of internal, not less than of external peace, was necessary, in the case of the social and the gregarious animals ; since, not merely would one evil have been substituted for another, but these smaller limitations could not have existed. Whatever be the cause through which the association is formed and preserved, it is the source of limitation, because it is the central attractive force ; though it

could not have been enumerated among the general causes, as, in reality, it is not perfectly known. The term social principle, so commonly used for explaining those associations, expresses a fact rather than its cause. But, whatever may arise from the simple love of society, or from some indefinable mutual attachment, we can trace at least two instincts, of which the one also is negative, as its effect is the preservation of internal peace.

This may be called the instinct of property, for want of a better term ; while, without it, we cannot well see how the internal order of these communities could be conducted. Yet we forget, even as philosophy itself has done, to note it ; although knowing that human societies cannot be preserved without some substitute, scarcely even to the extent of a single family. In the associations of the sea birds, this respect to property is strongly marked : practically, it is the moral sense so often discussed : though a term to excite a smile, in the metaphysician who allows no mental organization to the inferior animals; and who will be much more surprised at being asked to believe that God governs the minds which He has created. The stored fish lies unmolested, by the nest or the young, although the neighbour is in close contact with it ; while it flies abroad to labour for itself, though it might find ample supplies without moving. In the bees, similarly, the facility of mutual or internal plunder, is perfect, but the rule is the same. This appears not less true of the beasts of prey, even in the unsocial state ; though it is easy to attribute the self-restraint to a principle of fear. In the graminivorous herds, similarly, the spot occupied by any one is surrendered to it, though it may chance to be the only one of value : there is no contest for the same mouthful of

grass, even when there is scantiness amounting to famine; while, but for this law, there would be endless private war. And the existence, not less than the necessity of such a law, is proved by the result of its absence: were it not for other equivalent laws, a similar herd, or association, of human animals would contest possession through force: as they are certainly not very widely restrained by the simple respect to property.

The other instinct to which I alluded is equally a cause of internal peace; though it may be regarded as a bond of attachment also, if any one pleases. It is notorious that the Divine wisdom has established a system of monarchical government in every society of animals, with a corresponding instinct of obedience; leading us to infer His conviction, that in this manner alone, or best, were peace and order to be secured. Thus does one opinion lead all, even under distant migrations: the instinct of passive obedience prevents all rebellion and breaking of bounds; so much easier is it to rule through submission to one opinion, than by attempts to make all opinions agree. In the case of the politico-social insects, the appointment of the monarch is decisive: it is the Creator's own nomination, and there is no question. In the gregarious animals, the most wise, or the most powerful, or possibly the one which is so ordered, assumes the command, when implicit obedience follows: should there be a contest of rival powers, as happens under the juncture of two communities, the weakest submits, and there is peace for ever after.

In these modes then, are proximate or neighbouring societies of animals preserved from mutual interference, and from the hazard of internal disorganization. As far as these systems prevent such distant motions as

would interfere with the desired order, the mode of operation is evident. The politico-social population will not desert its property; while there also are its affections otherwise fixed in its expected progeny. If it colonizes, the leader determines for all, in those monarchical states; as all the other migrations, of whatever nature, are not less orderly; leading to no disruption of the society: while the purposes, in every case, form portions of the total system of government, whether those be the search of food, or of places for breeding, or movements for the destruction of a superabundant population, or for objects still unknown. The migrations of the African herds, of the American Pigeon, of the Swallow, of the land Crab, of the Lemming, and of the Locust, are examples which might easily be extended.

The love of ease, or an aversion to motion, being the principle of indolence, appears also to have a considerable effect in producing the limitations of animals. We are so accustomed to the rapid and vigorous movements of the birds, in particular, and the ideas of motion and restlessness are so widely associated with the animal creation, that we acquire the habit of believing in their love of action for its own sake. This however seems an entire error; if we except the young, where a superabundance of nervous energy expends itself thus, without any apparent object; although there is probably a purpose connected with their growth. Thus we are taught to pity the confined bird, under the magical terms which corrupt our judgments in deeper matters; but it is happy, as I formerly observed, if supplied with food: nor do the wild ones ever move far, if they can find this at hand. The search for food is the great inducement to all motion in animals; admitting, of course, the other familiar causes, in building,

or whatever else is necessary for the continuance of their races. The Ox is ever at rest when not compelled to eat ; the carnivorous animal sleeps when it is supplied with food ; if the rapid motions of the Deer tribe are not for the same end, they are for defence through escape ; if the Dog chases without hunger, it is education, or the excitement of the habitual instinct ; and though the Horse runs under its implanted instinct of escape, or through emulation, it is well content to rest for ever in its stable. The activity even of the birds, is a strong necessity where it exists : if the Gannet and the Frigate-bird are ever on the wing, it is because they must labour or starve. Thus it seems also with the fishes : rapid, yet easily fatigued by motion ; always sleeping if not in pursuit of food, and, if performing great migrations, still impelled by the same necessity which stimulates the birds to their extraordinary exertions.

Be the powers of motion therefore what they may in the animal world, all evil consequences are prevented by the want of inducements to abuse them, or, more justly, through an instinct or implanted desire which renders rest preferable, and pleasurable. And if merely wilful or purposeless motion ever occurs from the occasional excess of nervous energy, whether through undue rest or youth, a small quantity of action becomes the remedy, and the prescribed boundaries are not infringed. The power to move, therefore, does not lead to detrimental motion, to any rebellion against the Creator's political government : while all the inducements to it are kept in His own hands, as the bounds of those are the lines by which He has circumscribed their food.

But if aversion to move, or a dislike of wandering,

is a negative restraining force, there is a positive source of restraint established, in the instinct of localization, or the attachment to places: to the place of birth, or to the accustomed place, or to a place possessed of certain attractions to the several kinds of animals, which we do not always conjecture, though some are sufficiently obvious. The two former I have elsewhere pointed out among the causes of domesticity; and they also determine the limits and places of many of the distant migrations, as in this they are connected with the act of breeding, to be immediately noticed. And the value of this instinct for the intended purposes, will appear on a slight reflection. Though their food may limit them within certain bounds, those may be very wide; so loose and so divergent as to produce no effectual controul: there may even be none, not any check from climate; while it is thus we find the wide-spread Fox, and many more. Were the Lion not circumscribed by climate, if this indeed be the power, it might wander the world as the Fox does, since its food is everywhere: did all range like this animal, the earth would become a scene of confusion. The instinct of locality thus becomes a centripetal force, tending also to a point, which restrains within certain bounds the appointed wanderings of those free bodies after food; as the sun of each system is the restraining power of its planetary attendants. In this way among others, has the Creator curbed the motions of animals, that He might preserve the order of His universe: while in admiring the wisdom and power which have wrought by means equally simple and sure, we must praise that beneficence which has not only left the free-will entire, but rendered this local attachment a desire and a source of pleasure.

I need not seek to point out the causes of those

attachments which do not arise from birth or habit : the facts suffice, as they are familiar. The Hare does not quit its home, under whatever succession of alarms ; the Sheep soon learns the bounds of its mountain pasture, and abides by them ; the Stag holds to its accustomed range, though the land is all before it, to choose ; the Eagle's rock is the nest of centuries ; the ancient oaks, are to the Rook, the city of generations ; and the Heronry long outlives the feudal family under which it has grown. If the Gannet might wander to the utmost regions where a fish can be seen, it has, like the Eagle, its home ; nor will the unceasing annoyance of years drive it from the cold rock of its affections. Food is not the motive, for that is everywhere : it is not offspring, for that source of attachment is of short duration : and it is not necessity, since it might find refuge in a thousand rocks, as convenient, and more free from outrage. It is the appointed home : that suffices, and it obeys the command. Thus is the Cod-bank the everlasting habitation of the powerful and often wandering fish, which might feed anywhere ; thus do the far journeying and long absent Swallow and Duck return to their native or accustomed homes, as similar attachments are found in the ordinary birds of our fields and gardens. Even man is not without this instinct, appointed for good purposes, if not for the same which concern the animal creation at large ; since he is free of the whole earth, and as unlimited in desires as in freedom. And it is a restraint even on his free-will. He does not indeed admit this, because he does not feel the chain that ties him : wearing it willingly, knowing that he can break it, were it but to prove that his will is free ; yet forgetting that he does not readily punish himself for the gratification of this vanity. Like the

animal, he is bound by his affections: a prisoner in silken bands, but not less a prisoner in the hands of his beneficent Governor.

It should be almost superfluous to say that the instinct of locality and the social principle are often united; since, as I have before remarked, more than one cause has been intrusted with the production of this order. Hence may it sometimes be difficult to assign the real one, if there be any case where two are present, and only one is used. But refinements of this kind can answer no purpose here; though they may serve to furnish disputes for natural history. In the case of the sea birds, just mentioned, both seem to operate. Before quitting this source of limitations, I must however observe, that it is widely effective for order, when the instinct of locality is so general or lax, that both the fact and its results easily escape notice. To mention the separate kinds of residence chosen by the birds of prey, by the wild gallinaceous birds, by the Swallow, the Lark, the Sparrow, the Duck tribe, and the small birds of our hedges, will suggest much more of the same kind, to even a slender observer of nature, not in those alone, but in the quadrupeds also; as he may possibly have long known it all, without having perceived that it was a portion of God's government: of the extent of which he may even have thought, as men think on those subjects, without ever suspecting its practical reality; its universality and its minuteness. It would be better for man, nevertheless, if he would think thus: he is not the sole unconcerned in this question, the only being excluded from this government.

The instinct to breed in particular spots is a source of localization, yet of such a nature as to demand a dis-

tinct place. It is either a cause of fixed attachment, or a central force to recall the wandering animal at stated times. In the sea, it seems to be one of the ordinary causes of local limitation ; though shelter, food, and light act with it, or independently of it, in fixing the fishes of the shores to those places. Here also it brings back the long-lost Salmon to its river ; as it apparently determines the place of the Swallow, though not the cause of its return. But while its separate power, in the case of the land animals, is either nothing, or is not known to us, it is on account of its power over the fishes that I have distinguished it as a separate cause, because this is a portion of the total government which especially concerns man. It is thus, if by other means also, that the fishes are brought within our reach, as a source of food : while without this localizing power, there are many which we might not even have known. Such seems the case with the Salmon, unknown in the sea till it is approaching the shores : while but for this inexplicable desire for a peculiar breeding-place, the food of thousands would have failed. This is equally true of the Herring, though its history has been unaccountably misrepresented. The armies of this fish have been termed "heaven directed." It is a just remark : but all are equally directed by Him who governs for the sake of man among the rest, while neglecting the interest of none among His various and multitudinous children. It has indeed been attempted to deny this intention, by saying that "the pressure of the ocean" prevented the fishes from residing in the deep sea. There are necessities in Creation ; but only when the reverse would imply self-contradictions. This at least is not among them. They might have been created to bear its pressure, had He so chosen. They might all

have swam at moderate depths, as the oceanic fishes do. All might have lived as the Ling does ; distant and deep, and demanding great labour to secure. The flat fishes, apparently having no air-bladder, might have resided anywhere. And they which pass a part of their lives out of the reach of man, might have passed the whole. But it is more than enough. He who does not choose to believe in a governing Creator, will not be influenced otherwise by facts, nor convinced to the contrary by arguments.

The last cause of limitation consists in food. A plant or a set of plants has been appointed for the food of an animal, as its inclinations have been directed or confined to that : this food has been localized, under the peculiar and separate destinations of the vegetable creation ; and the boundary of the plant is therefore that of the animal. I have elsewhere shown the causes and the nature of those limitations in vegetables : and we cannot doubt, that whatever other uses may be served, this also was a principal intention in these arrangements. It is generally, however, but a lax law : but it is rendered effective by the various other causes of more definite localization in animals.. In the herbivorous ones in general, it is far from being a narrow limitation : but indolence or local attachment effects what could not have been attained by means of a wide-spread food. In the Goat and the Deer and the Sheep, it is more strict, because their preferences are for shrubby lands and mountain pastures : in the Reindeer it is absolute, if, in the state of nature, it is confined to the lichen rangiferinus. Similarly in the Turtle and the Manati, it would form an insurmountable one had not the construction that effect without it. The birds present a parallel case. There are many which, as far as

food alone is a check, might wander wide : but there are others, like the Cock of the wood, the Grouse, and the Ptarmigan, possessing a choice by which they are limited, as similar limitations, from the same cause, occur in the duck tribe. In the insects, the controul through food is often absolute, superseding the necessity of any other. It may restrain the animal to a single plant ; it confines the Mite to that which is, at once, its dwelling and its food ; and it imprisons the larva of the gall within a space no larger than its own body. I need not, however, pursue a subject so simple ; if I am obliged to remark how it explains some imaginary mysteries couched in that phrase, the stratification of animal life ; far more affected in this case than even when applied to the climates of plants, as they lie in vertical order, on the high mountains between the tropics, and are thus more accurately defined and more easily compared.

But the limitations of specific vegetables form only a small part of those which depend on food, though they constitute the basis of all. The system of prey extends the power of this cause much further, so as to involve nearly all the animal creation. Where the vegetable eater lives and ranges, there also is the abode or the range of the enemy ; while the other sources of determination or restraint effect the rest, for the one class as for the other. Heat, cover, and a ready access to water, conspire with the Buffalo and the Antelope, in determining the Tiger to its Indian jungles : the herds of southern Africa form the free limits of the Lion ; the hot and dry sands which it prefers become its narrower ones. The Crocodile, determined to rivers by its food, is not less confined to them by its construction and the narrowed range of its powers : it

is a double law of restraint. Thus it is with the sea-birds; able and efficient where their food lies, comparatively or entirely powerless elsewhere. It is more than a double law. If they will use no other food, if they could not attain it, though they desired so to do, thus are they compelled to live on the waves, to sleep on the shores, and to breed on the rocks; as they are also commanded to adhere to their communities, and appointed to homes which they must not quit. Thus carefully has the political order of the world been guarded: it is law above law, and check within check: it was to have been an orderly government; and care has been taken that it should be such.

It has been stated, as if it were a remarkable fact, that the Condor does not quit the Andes, though provided with ample powers to go anywhere. There is nothing mysterious in this: it is the history of creation. There is no reason why it should: there is every reason why it should not. As little reason has the Albatross to leave that ocean where it finds its food: it was created for that food, as that was created for its use. Could it ever become capricious or wilful enough to make the attempt, it must return to the regions of the flying-fish. But cases so simple as this are rare: the greater number are of the complex character, which I have just noticed. The Chameleon might not quit the tree of its food, but it is chained there by want of power. Did the Mole quit its worms, it would be glad to return; but the light compels it, as it would also be helpless in any other place than the under-ground prison of its choice. The powers and the food of the Woodcock, equally, confine it to its bogs; and those of the Owl to its nocturnal life. The nightly Mouse has its appointed range and boundary: but of that it would

have known nothing, had not the Creator given one class of powers and withheld another. The food appointed for the Camel might have been contested: that is now impossible; no powers can contend with its own. On the other hand, the fishes and the sea-birds are rivals in the same food, and each class is provided with ample powers: but the lungs of the one and the gills of the other, the atmosphere and the water, have marked the limits of their permanent occupancies. The house-swallow and the river-swallow follow the same food, and possess the same powers on every point: they might reside together; but their local attachments, and their choices for breeding-places, are wide asunder. Thence do they not interfere with each other, while each performs its appointed duty. But these illustrations might easily pass all bounds, since they comprise the civil history of all the animal creation.

Such is an indication, rather than a sketch, of one portion of the government of God in the animated world which He has created. Hence the order and the peace, as the animals themselves are concerned, and as man is one of the protected subjects of this government. It is a complicated system of prohibitions and permissions: but, to the governed, the permissions and the prohibitions are one; since all is equally free-will, all checks are inclinations, and all restraints pursuits; as all coincide in the production of happiness. This is the perfect model of good government, as it is the solution of a wonderful problem: while it is solved in a marvellous manner, in a manner worthy of God.

But does He thus govern, or not? Or does all this govern itself, or is it governed by chance, or is it not governed at all? We can try. Abolish all the laws, take off all the restraints, unbar the prisons, open the

cages, let loose the world : give the same powers and the same freedom to all ; wings, fins, velocity, strength, arms, give them but the powers of man, or give them his desires only : let all desire everything ; break up the smaller states and the independent governments, destroy all attachments, do less than all this, do the smallest portion of it, and try. Man has sometimes attempted less than the least of this, in his own petty and limited governments, over a single animal, and that too a reasonable one : but his success in proving this hypothesis has not been great. It is the soundest politician who will be the most ready to acknowledge, that the political government of God has been wisely planned and is ably administered.

CHAPTER LIV.

ON THE BALANCES OF ANIMALS.

I POINTED out in the last chapter, the connexion between the balances and the limitations of animals : the present will complete all that I can here undertake to say respecting the Divine government in the animated world. This is not indeed a moral question, as it concerns themselves ; since, in this case, they are, in no way, under their own direction. But it becomes such in its bearings on man : both as the balances of animals affect his situation in the world, and as he is himself empowered to influence and alter those. Under this view, it forms a part of the Creator's moral government ; of which, other portions are sketched in the remarks on the feeding of animals, their uses to man, the systems of prey, and more.

The various species of animals, the different numbers under those, the variety in their sizes, powers, and pursuits, the differences in their climates and in their localities, with the remarkable and multifarious limitations just described, and the evidences of some system devised for feeding them, obscure as that still remains, all conspire to prove that there is some apportioning of their several kinds and numbers, in addition to simple limitations, intended for some useful purposes in this political arrangement. This is the balance, or system of balances, under the Divine administration on this

subject ; as it is the question now to be examined, as far as that can be done under very deficient information.

I formerly showed that the world was always full, as the exuberance in fecundity, and the variety in plants and animals were directed to this end : further showing why the several species of the latter should differ in sizes, powers, and pursuits, because those implied different consumptions of food, and as, in this manner, a regular system of feeding could be established. But a system of this nature could not have been attained, without further allotting and proportioning the several kinds, and the numbers under them, in some manner ; so that, in the first place, all should be ensured their food, and, in the next, that there should be no waste, if that also could be accomplished. The fishes, for example, now suffice for the supply of their own kinds, of the seals, and of the sea-birds ; but they might not have sufficed for all, or they might have sufficed for more. Presuming that they are rightly apportioned at present, it is a perfect balance. On the other hand, if the caterpillar should consume all the food of the herbivorous tribes, it would be a defective balance ; but it is a right one when they are so apportioned that there is food for all. Or if the regularity predominates, it is right ; because occasional infringements are allowed, or commanded for specific objects, or perhaps could not have been avoided, under the contending necessities of an intricate system.

Taking, first, that part of this administration which consists in feeding animals by vegetable food alone, it will be a perfect balance whenever a sufficient number of kinds, with an adequate one of the several populations, are so placed on any given territory, that every kind of vegetable food is consumed, so that there is

no superfluity to be wasted : it is the management of man for his domesticated animals, under systems of pasturage. It will be an imperfect balance, on the contrary, if the animals are subjected to famines, as in southern Africa, unless the power of migration should be given to compensate this ; as it is given, widely, so as to extend the means and the systems of balancing, beyond definite tracts or territories. It is defective, in the reverse manner, if there is a superfluity of food for which there are no consumers ; since we must always presume that the intention of producing food was, that it should be eaten. The Chamois is diminishing in the Alps, and the Ibex has nearly disappeared : if there is no other animal with sufficient powers to occupy their peculiar places, the plants which nourished them become useless : it is waste. With us, the mountain Sheep replaces the banished Goat : the original balance was destroyed, but there is another one substituted ; very different, yet equally perfect for the designed end.

This is the simplest case of the system of balancing, under the regulation of vegetable food. But a balance is equally required, as animal food is concerned, or, under the arrangements respecting prey : that, in this manner also, all should be fed. In this department, however, the waste must be differently judged. If the plant is not consumed, it returns to the elements : the materials are not lost, but the labour of construction has been expended in vain. If the herbivorous animal which might have served as food, is not used, it continues to perform its own offices and enjoy its existence : and the only waste therefore will be, the death and dissipation of that superfluity of production which was designed for the carnivorous animal ; while that may follow from the want of sufficient vegetable food, and

will always do so, if the superfluity is absolute. In the sea, for example, if the fry of the highly productive Cod were not consumed by the destined fishes, they would equally be destroyed for want of food; and those myriads would therefore be wasted. It would be a bad balance here, should there ever be such an excess of the carnivorous animals, as to destroy the herbivorous ones; since the final result must be their own destruction; while they would also be the cause of wasting vegetable food, by removing the consumers: as there may be much evil from an imperfect balance, far short of absolute destruction. But under this mode of feeding, the arrangements become much more complicated than under the former. The quadruped may eat the plant, of which the bird consumes the seed, while the insect feeds on the honey: but the Lion cannot feed with the Swallow. There must be many kinds of herbivorous animals provided for the different carnivorous ones; or, reversely, many species of the latter to consume the superfluity of the former.

I need not state these cases at more length, nor complicate what I have endeavoured to simplify, by noting what must further be necessary, inasmuch as carnivorous animals feed on others in their own division. These are general views, or hypothetical problems, slightly sketched, and easily filled up; to the extent at least of the knowledge that we possess. There is no reason however to believe that they are solved in this very perfect manner: but there is always an approximation to the theory; as there are also arrangements for the purpose of making these approximations, and for renewing them under changes which arise, necessarily, from a variety of causes; so that there may always be an average of well-regulated results. This

is one of the most striking among the efforts of the Divine wisdom in this complicated and difficult government; as will appear more clearly hereafter, in noticing the changes in the total system, which must be for ever met and counteracted. But the means are much too difficult for us to investigate; as they would demand a knowledge of the details of Creation which we can never possess. All that we can perceive or conjecture, is, that it must be effected, chiefly, by means of the variety of species, the variety of powers, and pursuits, and numbers, and magnitudes, and the provision of superfluous fecundity. We might even explain single cases in this manner; but it is not necessary here to give the examples which any one versant in natural history can supply.

I have just concluded, that to avoid waste was one of the reasons for the system of balancing. All were to be fed, but nothing was to be wasted. They who side with Descartes will call this a dictating of conduct to the Deity. I must judge otherwise. It is reasonable conduct; and if He is not a reasonable Being, what is He? It is true, that He of all power needs not economize: and we must not say that He has wasted His labour in constructing a plant for food, if it is not eaten. But what if He designed to set us a lesson? There was One to whom all power was committed: He also needed no economy; but when He taught in words, the lesson which He gave in deeds, let all be fed, but let nothing be lost, whence else did He adopt this conduct, and give that audible command which is ever presented to our eyes? one coincidence, among hundreds, between the visible works and the declared will of God. It is declared all through creation: nothing is wasted. That which the animals, constructed, varied, to con-

sume all imaginable superfluity, do not use, returns to the elements, to travel the same rounds of utility; as the superfluous drop ascends to the clouds, that it may return again to fertilize the earth. The minutest fragments are for ever gathered up; that nothing be lost. Fire cannot consume; destruction shall not destroy: there is nothing of all which He has created that shall be wasted. The lesson is before us; like others: we have the usual permission, to disobey the command, as to neglect the lesson: but all must decide for themselves, whether this disobedience also shall not be judged.

But a regulated system of feeding does not include the whole question of balances. In the herbivorous tribes, there are animals which commit waste, sometimes by excess of numbers, like the locusts, or by destroying what they do not use, like the larva which eats the germ of the turnip or the radicle of the wheat: attacking the principle of life in the plant, and impeding the expected produce. Animals of such powers might therefore extirpate all the other herbivorous ones, by anticipating their food, and, through the production of famine; as the consequence would also be the destruction of the carnivorous ones. Thence does the wisdom of this government contrive the system of checks: and thus do the contrivances for balancing the several animals become still more complicated: while as this portion of the needful policy is intrusted for execution to particular species, the double result is a system of feeding attached to one of necessary controul: the destroyer is rendered useful in supporting others. The primary evil here, is also but contingent, while it is the result of designed good: the superfluous fecundity was conferred on the destroying animal, that food might be produced

for the carnivorous one. It is necessary, therefore, that the animal destined to this food be present to consume it, else the evil of a complicated waste follows : while a due apportioning of all these several animals, in different modes, becomes a balance under the system of checks, as, whenever it is perfect, the evils in question do not occur. A sufficient number of the appropriate birds, for example, prevent the caterpillars from destroying the produce of our gardens, while this race is also allowed its share, and its place in the world ; and in this case the balance is perfect : in the reverse circumstances, it becomes a deficient balance. Thus also, much more widely, as the animals themselves are concerned ; while this system of checks is further peculiarly required for the sake of man, empowered to command and to use the world, in preference to all other animals, but unable to attain that end without their aid. Under this government, they are the agents of the Creator, appointed and commanded to render him service.

These then are the purposes of the system for balancing animals. It is, that all may be fed, that there may be no waste, and no superfluous injury committed against any animal ; above all, against man. This government is also universal, ruling the whole world : but a little reflection will show, that all the animals of the earth cannot be jointly engaged in it ; whatever may have been thought. It is not one political administration in its details, though it is one as God is concerned : there is not one balance for the whole world, because that would not have sufficed, nor would it have been practicable. The climates of the earth differ : the plants differ, in consequence, and it was intended that they should do so. The animals also differ, accord-

ing to the climates and the food, and more: they are the limitations described in the last chapter; a designed and principal portion of the total system of government. The whole therefore becomes an arrangement of separations or segregations, more or less complete, under an evident intention; implying, consequently, many different balances: differing in place, primarily, and necessarily differing in nature, from the various modes in which the animals are distributed. Segregations of this kind are absolute in the case of insulated tracts; while, if very small, were there no other reason, they can contain but few kinds of animals, and demand therefore far different balances from the more extensive and less definite tracts on the continents of the earth.

It is plain therefore, that there can be no "balance of species" as to the whole world; though there may be other uses for all the species that exist. There is no "whole world" with reference to an association of animals; if we except man and his followers. There are as many different worlds, separately balanced, and often balanced under different arrangements, as there are segregated tracts. It is also equally plain, that if any one of these associations proceeds under perfect good order, the whole earth might have equally been governed under any of them, as far as a balance was required; since a very few are sufficient for such a balance. And therefore might the earth lose a large number of species, without any injury to a system of perfect balancing. America, with a slender exception, was a separate world of animals when first discovered; and so was New Holland: but for man and his followers, they are still the same. Either, then, or both, might be exterminated, without affecting the rest of the earth; or, reversely, all the species of the old continents might

vanish, and be replaced from America, without any sensible inroad on a perfect balance of creation.

It is evident that I am here alluding to an hypothesis: and it is needful that I should state it, because, were it true, the present sketch of the Divine administration would be false; and, still more, because the Creator's plan could not possess that reference to man which I hope to prove is one of its principal objects. Authority is pernicious, when, to high name, there is added imperfect knowledge. It is only for this reason that I note Paley among those who assert that the perpetual security of every created species, was among the designs of the Creator, and that none had been lost since the animals were first placed on the earth. Thus also is it said, that this was necessary for preserving the balance of species; while these visionary facts are quoted as evidences of the wisdom of the Deity. Metaphysicians have ever been pleased in detecting the errors of the naturalist theologians: treating them as the feeble and injudicious friends whom proverbs caution in vain; as they have sometimes also turned their triumphs to no good purposes. And it must be granted to them, that before any proceeding in creation is produced as a proof of wisdom, we ought to be correctly informed, both as to the facts and their results. I fear, that in this case, they have reason for their criticisms; whatever conclusions they may draw in consequence.

The facts are not what they have been represented; the Creator's plan has not been understood; and His apparent intentions have been misstated. Many species have been lost: the balances in creation have been very different from what they are at present, as they have differed from each other at many former periods; they differ almost annually, and they are destined to differ

still more, even without end. It is but too difficult to trace the Creator's plans in anything ; and the greater caution is therefore required. The most serious errors respecting the Divine government, and in far weightier matters than this, have arisen from the want of prudence and care : even the piety which is not well guarded by knowledge and reason, is too often but a hazardous one in these cases. Nor must it be forgotten, that in thus ignorantly deciding, we impede the investigation of the Creator's real designs ; since we thus persuade ourselves and others, that we have already fathomed the depth of His counsels. It is true, that He has guarded the species which He has created, with a solicitude which I have often pointed out in this work : but it is for other reasons than the one thus suggested ; while this care has its exceptions, and for apparent reasons which I shall attempt to assign hereafter. It must however be admitted, that the existing variety and numbers may afford the means of better adjusting the changing balances ; though the case of America shows that all the created species are not required for this purpose.

Hitherto I have spoken of the balances of animals in the earth, as if they were fixed and unchangeable, as if they had been thus disposed at the first, and were to continue for ever. But such permanence is unattainable. The changes of the earth's surface, from enlargement, revolution, improvement, prevent it : it is in a state of perpetual flux, from natural causes, already understood through former chapters, and from the conduct and power of man. It has been the same from the beginning : the earth has not rested since it was created, nor will it know rest till it shall end. The vegetable produce, the food of animals, is ever changing ; the very climates change, the animal distribution

must have been ever varying under the spreading of the created population, and it is continually varying now, under the same, and other causes, consisting in their mutual actions on each other, and in those of man on all. Hence then must the Creator's government consist, not merely in the presumed original production of different balances, but in ever forming new ones, in all parts of the world, so as to meet all these changes, and maintain a well regulated organization of all the parts and of the whole. And as it is this question of changing balances which concerns the main object of this chapter, namely, the progress of man on the earth, it is needful to point out a few facts in illustration; from the great oversight or misrepresentation to which I have just alluded. Did those facts not exist, the power of the Creator would appear to be curbed, under a necessary inference from the hypothesis just stated. It will be seen, on the contrary, that it is unexhausted, and inexhaustible: as the result is, to attain ends which could scarcely have been overlooked, but which, without this, would have been unattainable.

I need point out no further examples of different original balances, after the great examples of America and New Holland: it is the history of the animal creation, in every part of the world. As far as changing ones are concerned, the researches of geology prove the loss of a great number of species since the commencement of the present condition of the earth. Many different balances must therefore have been made during the progress of this extinction; presuming, or admitting, with the hypothesis just noted, that the Creator's plan consisted in a balanced system for the whole world: while it being also admitted that man is but of recent origin, in comparison with those, and possibly with many

more, his creation implies the production of a new balance ; among the greatest, assuredly, which the earth has ever undergone. And putting problematical cases on the same ground, we cannot believe that any balances would be destroyed, injuriously or irreparably, though the Rhinoceros or the Elephant, or many more, should follow the lost animals ; be, to us, what the Mastodon and the Megatherium now are. They have very widely disappeared already, under a gradual progress of extinction ; and no inconveniences can even be imagined should they utterly disappear. The variety of creation will be restricted by further losses, as it has been already : but there is a new balance forming, while the old one is failing ; and there is probably not an interval of imperfection or disorder : while, under cases of more rapid extinction, if these could ever occur over the entire world, the fecundity and variety of other kinds would produce a speedy, if not an instantaneous remedy.

In the cases of partial extinction under segregated tracts and associations, it is easy to watch the progress and the consequences : the conviction is perfect in those ; in the former, we can but infer. Our own island once possessed the Elephant, Rhinoceros, Crocodile, Hyena, Bear, and many more ; as, in times more or less within record, it has contained the wild Hog, the Beaver, the Elk, the Urus, and the much more recent Wolf. It has therefore undergone a succession of different balances, under the loss of species ; while, in whatever mode the successive new ones were produced under the ancient extinctions, we know that the recent ones have been the results of our own conduct, as the consequences are visible. It is assuredly fuller of the large animals than ever ; probably much fuller

of animal lives; while we experience that it is a good balance, and possibly as good as is easily attainable under this complex system, no more intended to be perfect than is anything else on this earth. It is a little world within the larger one, improved by the loss of species; since it contains a greater sum of happiness, under an order probably better than any preceding one. No person at least would consent to exchange the present system and balance for any previous one. And this is the essential question: the new balance is preferable to a former, or to all the former ones: though, of course, under sufficiently obvious causes, the reverse must sometimes occur. No hypothesis can therefore decide that what is good for one portion of the world would not be good for the whole: and thence a further extinction of species for the world at large should be admissible under the Creator's plan, as far at least as those may be supposed purposeless for aught else than the preservation of presumed balances.

But there are evils also, unquestionably, attendant on the good. The drainage and agriculture which destroy one set of mischievous insects, may introduce another equally pernicious; as, in destroying the food of wild birds, they may also deprive us of what we would gladly have retained. But if the Woodcock is thus banished, it is replaced by the Partridge: it is another balance; and we cannot possess contradictory things. Thus has commerce generated a pure evil, in the Cock-roach, feeding no animal, and checking no enemy. But these pernicious or imperfect balances are almost limited to the case of the insects; because, then, man wants power or knowledge: he cannot destroy them himself, nor get possession of the agents appointed for this purpose. But they follow by degrees,

as the Crossbill has discovered the increase of our fir plantations : the balance has been subverted ; but it is replaceable, and the remedy arrives at last : the inconveniences are temporary, as it is the suddenness of the change which produces the evil.

Of the necessity of new, and continually renovated balances, it seems also superfluous to offer proofs, under any of the causes through which they may be required. It is plain, for example, that Borneo (as the mountain land it once was) must have been very differently balanced from the Borneo doubled in extent by the woody swamps which its rivers have produced ; that the extirpation of the Hyena or the Wolf from Britain, must have demanded the production of a new balance ; and that the introduction of European man into New Holland, will call for a long succession of new ones, as he shall make progress over that once balanced world.

The general conclusion which follows should now be evident. It does not appear, that in creating the several species of animals, it was intended that all were to be preserved till the earth should end. On the contrary, it seems deducible that certain kinds were to retire, or be withdrawn, when they had done their duty under a certain condition of the globe, or had possessed that share in the earth which they could enjoy without interfering with the future ones which were to arise, or increase, under its improved and progressive states, in whatever manner induced. Each change has been equivalent to a new earth, whenever we compare far distant periods ; though the gradual progression prevents that from being observed under short ones. Hence, what may be viewed, for the present purpose, as the creation of an earth, demanded a correspondent

creation of animals, or what is equivalent, a different set of species and numbers; constituting a new arrangement, or balance, for the entire world: while this has been partly effected by the extermination of those which had become unnecessary or inconvenient. Nor are the details difficult to understand. An excess of Mastodons, feeding as the Elephant does, might have prevented the increase of many animals, by destroying the forests. The Elephant, the Hyena, and the Bear, in Britain, would have a possession which none but man could contest against them: they are withdrawn that it may be improved; even as the Mastodon is dismissed from the entire world. And if this is a system of improvement, it is evident that it is one half of a plan, in which the extension and the bettering of the earth's surface constitute the other: while the proof of this, formerly given, becomes an equal proof that the Creator's design has here been rightly judged. Without that half which relates to the animal world, the other need not have been: the alterations in the terrestrial surface precede, and the new arrangements of kinds and numbers in the former, complete the intended plan; as the whole constitutes the progressive improvement of the animated creation. Hence the necessity of the perpetual reproduction of new balances; that the administration should be kept in perfect repair under all changes.

If I have already suggested that man is especially concerned in this progression and improvement, or that the design is ultimately directed towards his continued extension and the increase of his advantages in the earth, so has the execution been largely intrusted to himself. It is his destiny to labour; but while his inducement is personal benefit, he is made the instrument of good to races which he neither regards nor antici-

pates. In this, he acts on the animal world, both directly and indirectly : but his indirect action demands the first notice, while that is also far greater than anything which is produced by the ordinary physical causes, or by the powers and conduct of all the other animals united.

As I have elsewhere suggested, the Earth, as it now is under his dominion, may almost be termed the work of his own hands, his own creation ; seldom as we may reflect on the enormous revolutions which his incessant labours produce. He cannot indeed change the figure and extend the surface of the globe, as the actions of the earth itself do ; yet he aids even in this, while the changes which he does produce are of yet more importance. Could a Briton see what his island was, even at the period of the Roman invasion, he would appreciate what man performs on that world so apparently beyond his power ; as, under its extent, it would seem to defy those powers for ever. But a glance over America will suffice : such once was Britain : and as Britain now is, so will all America be. And it is not alone that he exterminates useless forests and drains pernicious swamps, that the entire vegetation of the earth changes under his hands ; since the climates themselves have been commanded to alter, and the winter to recede before him. In occupying the world, he creates a new one ; becoming rewarded for his toils, in the increase of his races and of his happiness. The useless bog and the shifting sands are covered with his harvests, the black and vacant forest is replaced by the crowds of his population, and the once poisonous marsh becomes the chosen seat of commerce and wealth. It is but to survey the deserted plains of Babylon and Nineveh, to see what it is that man can do,

and has done, for that earth which was given to him to possess and improve.

It is thus that he indirectly changes the arrangements of the animal world, through his power over their food; increasing the quantity or altering the distribution. But his direct actions on them produce still greater effects, in destroying the former balances and in creating new ones. He here selects or acquires followers; servants to aid him in his labours, or animals to supply him with food and clothing, without the toils of the chase. With those he fills the lands which he occupies, expelling, by force or otherwise, the former tenants. Many must yield, because their food has disappeared, as others must surrender it to the new comers; while many more, in some manner connected with those, disappear in their train. The whole system is deranged; but it gives place to a better one. Thus does he change the face of the animated as of the vegetable world; breaking even the ancient boundaries of climate, by covering the earth with his Horse, his Ox, and his Sheep; infringing on the original limitations, abolishing the old localizations, and producing new balances which involve even the species in which he takes no concern. In this also his wars on the wild animals aid; whether these be in the defence of his property, or for the supply of his wants; while his avarice or disregard of the future leads to the destruction which he would gladly have avoided.

He is thus the universal disturber of Creation; as we can scarcely assign limits to his power: but he is, like all else, one of the agents of the Deity, as he is the most powerful and the most highly trusted: a permitted regulator of the world, executing the original design of Providence. He labours to make the earth his own,

to rule all, determine the fate of all, and render all subservient to himself : while his success, if slow, and if occasionally interrupted, or counteracted, is sure. His progress is, to become that which he was named at first: the lord of all, the king of a creation appointed for his use.

Such were the words ; and we have seen that he is gradually acquiring the mastery. As he continues to multiply, he must go on subjecting the vegetable kingdom, to procure increase of food ; and as he increases that, so does his multiplication proceed. If occasionally checked by his moral faults, producing his political vices, still he must make progress. It is in vain to appeal to history, to prove that the present system is one of change, not of continuous improvement ; since, as I formerly remarked, there is a far greater weight of history in proof of the reverse. Power and numbers may be again transferred, as they have often been, large portions of the earth may return to their original rudeness and barrenness ; but the great mass of man in the world can never again be forced back to what it has been, unless it be through circumstances, of which we can form no anticipation. All that we see, on the contrary, tends to prove that the promise will be performed, as it is performing ; even though the words of that promise should be held in slight esteem. It is confirmed by that appointment of the means which we have seen, and by the certainty of their operation ; as it practically is by their effects. The government of the animated world has been organized for this very end ; as here again the facts of creation confirm the revealed word of God. These reasons might suffice to prove that the multiplication of man, with his increase in knowledge, and in goodness,

as in extent and power, was the Creator's design in the organization of the earth and that of its multitudes : but to those who do not doubt his future destiny, they are superfluous.

Thence also it must be designed that he shall finally monopolize the world against all the animals which might contest his possession, and restrict his numbers and enjoyments ; with such exception, of course, as must ever remain, where entire perfection was not intended, any more than unalloyed good. This is the great moral conclusion to which these inquiries have been tending : but in tracing the apparent perfection of one of the Creator's plans, they do not forget that there is a plan beyond all, under which every design for good stops short of what it might have effected. But under this prime regard to man, it is the character of this beneficent as well-ordered government, to bestow on all the inferior animals an attention which is practically equal ; since it is perfectly calculated to their conditions and wants, with the result of allowing them all the happiness which they can enjoy. There will ever be room, with man, for myriads on myriads of beings with which he can never interfere : the species may be different in numbers, and differently distributed ; even many more may disappear from the earth ; but the sum of happiness will be the same. It must even be greater, as it must be always increasing : since, in improving the earth for himself, man improves it for them also ; enlarging the mass of animal life as he increases the quantity of vegetable food. His Hop and his Bean are the causes of myriads of the Aphis and the Coccus : if he but desires silk and scarlet, the Mulberry and the Nopal are the sources of millions of lives ; while, for all those, we know not that one animal

has been driven out of creation. Could he be supposed ever to succeed in exterminating the Locusts, it would be to preserve, for more millions of other lives, the supplies which that ruinous race destroys.

Such is the result of a government founded by joint wisdom and beneficence. Let man be what he may, the supreme in the Creator's eyes, he is still rendered subservient to the good of all : the unconscious agent of that bounty which he cannot withhold or oppose, though he willed it. He dares not neglect the earth, because the immediate punishment falls on himself : his own interest is the interest of all which partake that earth with him. He may destroy animals, under the powers assigned to him ; he may ravage, in wantonness or wickedness, but even that wickedness shall not defeat the goodness of God ; for the blank is filled by others, equally enjoying, under a new balance replacing what has been disturbed, and for ever maintaining the fulness of life in the earth.

CHAPTER LV.

ON THE REVOLUTIONS OF THE EARTH.

IN a system of continuity like that of the Universe, conducted under general laws, where even the aberrations return to the point whence they began, and one species of disturbance is corrected by another, there are no longer any reasons to expect interferences of its Creator. The mechanism would otherwise have been insufficient for its ends, as I have formerly shown : and this could not be. But respecting the chemistry of the great bodies, we possess less certainty : and I hope I can produce one instance where such interference must occur ; because we can conceive no possibility of prospective general laws thus acting. I can do no more, however, than suggest this case : our knowledge is yet too imperfect to allow of my offering it as a decisive one.

I formerly (c. 6) demonstrated the utility arising from the mountainous irregularity of the earth's surface ; and further (c. 21) the enlargement of its dimensions from waste of those elevations : but I have reserved the consideration of the ulterior consequences to this place, hoping that they may offer an argument for the necessity of the Divine interference ; whence, from the demonstrated occurrence of the contemplated facts, it will follow that He does interfere. These facts are, the repeated elevations of land noticed in the twenty-first

chapter : no pre-established arrangement appears to be capable of producing them. He must therefore have produced them by a specific act of His will, when He saw fit : we have reason to expect similar ones again ; and as these will occur when a purpose is to be extracted from them, as it has ever been, we must draw the final conclusion, that He is watchful over that fitting time, and therefore, that His Eye is over all His works ; and this is His Providence.

I showed, in the chapter just named, that the loose materials brought down by water from the mountains are perpetually transferred to a lower and more distant point, of which the last visible one is the level and margin of the sea. But if we exhaust this analysis, the final and only point of rest is the deep bottom of the ocean : for the point of attraction is the centre of the earth, and the nearest attainable one the end of all motion. If, practically, this is not attained, it is, that the moving and resisting forces become balanced some time before. It is not less true, that the whole mountain tends similarly to the sea-shore, as all the land tends to the bottom of the ocean ; while the former is, practically, far more free to move to this easy point of primary rest, than the other is towards the absolute one. But even in this case, the moving force is a gradually retarding one : or it diminishes according to a certain power of the altitude of the land above the level of the sea, which at length becomes nothing.

Now, that which we can witness in many places, is occurring everywhere, all over the earth : and, under an indefinable duration, it must involve the entire land ; retarded as it may be, and even geometrically as that retardation may increase. It demands but Time ; though that might be a time surpassing our utmost conceptions.

And the partial effects, of which the possible total is the result here under consideration, may be seen in nearly as many places as the acting causes : while, in many of those, we can also trace the evil consequences, involving all animals, yet, most obviously, the race of man.

The contemplated effect is, when the level of the land makes the nearest possible approach to that of the sea. If a river be present, it becomes stagnant and spreading : sometimes, though there is none, the land becomes a marsh or an undrainable swamp, and the shore becomes unapproachable from the sea. If there should be no interior water, the result is a dry and barren sand. Similar effects will be extensive in the interior lands, in proportion as a general low level is attained : and should that level become equalled with the surface of the ocean, the marsh becomes co-extensive with the plain, be its extent what it may, while, to drain it, may exhaust even the resources of human art.

If, again, mountains are the chief agents for the descent, as for the distribution of water, the removal of these must be the cause of aridity. And, what an earth of absolute plain would be, under these circumstances, the African deserts will show us. The soil is not in fault. A shower will convert the parched sands of southern Africa into a luxuriant field : the fertile plains of India are no better than the Sahara in the season of dryness : and were even Egypt without its Nile, it would become no other than the desert which separates it from Tunis.

The general bearing of these hints is obvious : they show us how to contemplate an earth, of which the entire land exceeds in altitude the level of the ocean, barely as much as is compatible with its existence : the

paradisiacal land of Burnet. On subsidiary consequences, a few similar hints will suffice. Though the rains should continue, there could be no rivers, for want of inequalities and declivities capable of collecting many streams into one. Seaports would cease to exist; the shores would even become inaccessible; the ocean would be ever breaking its bounds; the ancient catastrophes of Holstein would be frequent and universal. There would be an entire change in the system of vegetation: not one in hundreds of the plants of the present earth would survive such a state of things. And with them, a great proportion of the existing races of animals would also disappear from the earth. Agriculture might scarcely remain practicable to man: his other food also would cease from around him: and if the wide extension of the plagues which already assail him from similar lands did not soon destroy his races, their gradual descent in numbers and civilization could not fail to follow, even to his final disappearance from the earth. I need not pursue a picture which a poetical imagination can easily fill up: and which a recent morbid love of horrors would have drawn long ago, had it been aware of the facts.

Such is the old age, the decrepitude, the natural death perhaps, of the present earth, as the habitation of animals. It could scarcely fail, ultimately, to be the death of all the races of terrestrial beings, at least. I have said that the ocean must break its bounds; and where would that influence cease? The mechanical actions which produce the effects thus far, must still continue, and sea and land would again become intermingled in one chaos.

Enough. The question now arises; will Providence interfere to prevent this result of His established laws? Will He terminate the whole system while it is yet valid

for the intended ends, rather than wait its tedious death, rather than witness the imperfect working of an exhausted machine, defeating the very purposes for which He appointed it? Will He do this, even out of mere mercy to the race of man, or protract through countless ages, the miseries of a race which He placed here to enjoy, rendered thus more miserable than their remote ancestry, without any fault of their own? Can it even be within His plans, to see that race which He has gradually raised to a high and worthy station, through thousands of years, thus decline to a worse one than that from which He brought them, through thousands more? The answer will probably be given, by all who think. He will destroy or terminate the present system of this Earth while it yet remains unimpaired: and that act of violence, involving in sudden destruction all life, will not only be an act of necessity, or a portion of the perfect system of His physical government, but will be an especial act of goodness; to the human race, of mercy.

Whatever be the great moral and religious reflections on this destruction of the earth, the act itself, to those who shall suffer under it, is but that from which many have suffered, at many periods of the world, and many more have witnessed. Such were the catastrophes of Calabria and Messina, of Quito and Lima and Lisbon. The immediate machinery is the earthquake: the cause is the volcano. But the volcano and the earthquake would then be universal: all life would vanish. The earth then becomes the utter desert which it had often been before: it has ended another period, another of the lives implicated in its total life: yet it is but to assume a new life and a still more perfect form, that it may once more, as we may presume, run the

same round : a renovated work ; a new, and again an effective machine, repaired by the hand of its Creator.

These physical views are derived from the past history of the earth : the evidences are furnished by geology : and these evidences being physical proofs, derived from what has happened, come in aid of the moral conclusions already drawn.

Should that which I have just contemplated occur, as we have other reasons for believing that it will, we cannot doubt the truth of the inference as to God's Providence which I commenced by stating. But the proof does not hang on this. If similar events, the very events on which this speculative one is founded, can be proved to have already occurred, then is the proof of His interference ample. Or, it follows, that although He may govern the Earth by general laws, still His eye is over those laws, and He checks or directs them as He sees fit, bringing also into action, other occasional powers, by special acts of His will.

The past history of the earth is a history of many and successive revolutions of this nature, and the evidences cannot be mistaken : they are equally demonstrable, simple, and explanatory : though, for what they are, I must refer, as I have formerly done, to the details of the science of geology. But the general fact is this. The supramarine land of the earth, during an anterior condition, has been carried down towards the sea during a long period, in the same manner as it is at present, while much of it has been deposited beneath the water. The materials have there been separated into distinct strata, during their stratification, according to their relative powers of buoyancy ; while, among them, colonies of shell fishes have formed another order of strata. These, once earthy, or loose, and once hori-

zontal, are now found raised to high angles, converted into rocks, and elevated high above the level of that ocean of which they were once the bottom. Thus do even marine shells occupy the lofty places of the Andes and the Himalaya. The strata are also bent and fractured, through the efforts of the same forces which elevated them; while many, moreover, and, in some of the anterior or remote portions of the earth as its progressive formation is concerned, all, bear the marks of heat, often proceeding nearly to fusion, or to absolute fusion. And lastly, they are accompanied by other rocks, not stratified, filling the fissures which the disturbing force had produced, occupying the greater intervals consequent on their disruption, supporting them in their new positions, and further, partially covering them in various irregular forms. And there is no difficulty in ascertaining that these changes of place and of condition in the submarine land, have pervaded the whole Earth.

The moving force admits of no doubt; because we have seen it in action, producing every one of these effects, though on a narrow scale. It is a volcanic power. The present volcanic rock is essentially the same as that which supports and fills the intervals of the displaced strata; and though on a smaller scale, it performs the same offices still. The volcano elevates strata now, as it did then: it impresses on them the same effects of heat, and it even fuses them. It raises, even from the bottom of the sea, its own liquid and burning rock into a mountain towering high above the ocean: and thus also did it act in those distant times, when it produced the granite peaks of Savoy and the porphyries of the Cordillera.

The volcanic elevation of the flat coral island of
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Owhyhee by the volcano of Mouna Roa, is an entire revolution for that single spot: whatever life was then on it, was extinguished. The elevation of the limestones of Dominica and Madeira from the bottom of the sea, by their respective volcanoes, was even a more perfect revolution. United, they are the picture of a revolution of the entire earth at some anterior period. The great conclusion here in view, becomes then as obvious as the proofs are complete and the causes demonstrated. At some period of a former state or mode, in the general existence of the Earth, and after great accumulations of terrestrial materials and of the shells of marine animals beneath the ocean, volcanic power was called into action over its whole extent, the living creation was extinguished, and a new earth, of a new form, and new materials, was produced from the ruins of the preceding one. And this event has occurred repeatedly since the commencement of this Earth as a solid globe. There have been many such successive forms of the earth, or entire changes of its external disposition: I need not here inquire how many. The demonstrations are as perfect for many as they are for one; and the very records of the several successions are preserved in the most unquestionable manner. The same causes are demonstrated, with the same produce of volcanic, or igneous rocks. It is equally proved, that very long intervals must have passed between each successive revolution and change: and if it cannot be demonstrated that the organic creations were destroyed at each such revolution, it is safely inferred; since no life could have remained, either in earth or ocean, under the state of heat necessarily attendant on the extensive causes of revolutions so universal.

Such is a sufficient sketch of the past: it is, at least,

all that I can here afford. The general conclusion is this : that the earth has proceeded through several distinct periods of repose, under a peculiar distribution of land and water for each, and with a certain allotment of organized life. That, in each of these distinct periods, it has gradually undergone changes similar to those which it is now undergoing, and that, at some date in that period, being a single life of the earth, as far as its office to be a habitation for a living creation is concerned, its machinery has been stopped or subverted, or this life terminated by a violent revolution, or death : while that death has become the foundation of a new life, to run again the same round : if, as I showed in a former chapter (c. 21), under a better form. It is the poetical Phoenix reviving from the ashes of the preceding.

The ultimate question remains. Have these revolutions been produced by a pre-established law, acting at a definite period, or do they demand a special interposition of the Divine power ? This is ever a difficult question to answer. I can only state the facts whence, as it seems to myself, a rational inference can be drawn.

Everything which occurs during a single period of the earth's repose, may be safely referred to pre-established laws, or to a law of continuity: as safely at least as anything in creation : with the exception, however, of the volcanic forces in occasional action. But the length of this period is the important circumstance concerned with the present question. Its absolute length, we never can discover, for any one period ; but this much is certain, that it has been extremely unequal in different ones. And as to its length in any one, if it cannot be conjectured, even within a reasonable approximation, yet a sufficient duration, for the sake of the

present argument, can be inferred, and even demonstrated. The base of procedure consists in the time required for a certain depth of earth to be added to the bottom of a given sea or lake, in that necessary for the production of a bed of shells of a given thickness, and in that demanded for the formation of a definite depth of peat. And comparing such facts as those with their times, and with the accumulated depth of strata during a single period of the earth, the easy and safe inference is drawn, that many hundreds of thousands of years have been occupied in such a work, and that, of such length therefore, must be one period of repose.

Now, while it is abundantly easy to talk of pre-established laws, since words save all the trouble of thinking, I know of no analogy in philosophy, nor can I conjecture any scheme, to explain the nature of a law of action, which shall be without action, for perhaps millions of years, which shall then commence to act widely and violently, then cease, with as little apparent reason as it commenced, and, after having ceased for another similar period, again commence, and so in succession; yet never in such a manner that the intervals of cessation are equal. Or, if viewed in a more practical manner, the volcanic power is ever existent, and ever acting, but very partially and dispersedly, as also uncertainly and unequally, both in time and place. Yet, on a sudden, after millions of years thus passed, it breaks out universally, and involves the whole earth; when, having performed a definite and useful office, it withdraws, and becomes the feeble and uncertain agent that it was before. This, under an hypothesis of pre-established laws, is a long train, prepared through countless ages, ready lighted, but not to explode till a

definite period: it is not even metaphorically that, while the various trains intended for successive explosions are unequal. What has the volcanic heat been doing through all this enormous interval? If it has been accumulating its force, the evidences of that increasing force should also go on increasing: it should not suddenly break out in the extremity of its energy; for there is no adequate restraining power. Philosophy, chemistry, must explain what I cannot: but words will not be taken in explanation.

After all, this is, as usual, the fabrication of an unexplained, inexplicable, and worse than cumbrous hypothesis, to evade the simplest of all possible explanations. But that simple explanation admits the Deity to the management of the machinery which Himself has made; it would allow that He knew the best time and mode of applying it for the purposes that He intended when He constituted it. This would be an absurd admission: it is one that philosophy can never make, or it would be for ever disgraced. There can be no philosophy, if once the Cause of everything shall be admitted to be the cause of anything.

I need not proceed. If there are any who shall admit my conclusion, that God has interfered by a direct and special interposition of His will, in every revolution of the earth, and that this is therefore an instance and proof of His Providence, it will scarcely perhaps be because I have proved it. He who expects to convince men by proofs to their reason, has reflected little, or noted little of the nature of Man. But if he, who, knowing man, has thus laboured to convince, shall truly reflect, he will not accuse himself of such insane hopes. He hopes nothing; but he knows that he has done his duty, as he has also acted under a force that

he cannot resist; the inexpressible pleasure of ascertaining truth, and placing it in the clearest light.

But if the value of this argument, derived from the subversion of earths, be denied, the very same conclusion follows from the renovations of the earth. No one but an absolute, and surely, now, a non-existent Epicurean, doubts that the Deity was the Creator of organized life. Once, it is admitted by all to whom it can be supposed that I am now writing. But that once must be multiplied as many times as new forms of the earth, following previous revolutions, can be proved: and such repeated renewals of attention on the part of the Deity, constitute an interference or a Providence. Had the philosophy of Aristotle (since custom names him) known even this much of the history of the earth, it could not have adopted the hypothesis on which I have so often remarked.

The conclusion which follows respecting our own earth need scarcely now be drawn. It will probably revive in a new one, as preceding forms of this globe have done. What religion may infer as to the period at which the destruction needed for a further renovation will take place, is nothing; since Revelation has communicated nothing. But philosophy teaches us to believe that this great event will take place while the machinery of the earth is yet unimpaired, and the conclusions of that very philosophy, equally with those of religion, assure us that it will be through a special interposition of His Providence.

CHAPTER LVI.

ON THE PRODUCTION OF ANIMAL AND VEGETABLE LIVES.

WHEN I reflect on the facts which constitute the basis of the present chapter, I feel that I have perhaps too strongly expressed my sense of the difficulty of proving the perpetual interposition of the Creator in the conduct of the world, and therefore His continued Government. Obscure as their essential nature is, the arguments drawn from them appear to myself unanswerable: but, as ever, it is the reader who must judge.

It is not denied, except by those who have been already answered, that the Deity did once create animals and plants; and I have also shown that such a creation has been repeated more than once. The theory that a law was once only established for everything, and that it has continued and will continue to act without His interference, is evidently therefore unfounded: and it will gain nothing by saying that such laws were established or renewed at different periods, since the assertion of non-interference, or of the absence of a governing Providence, is thus abandoned. It may be admitted, should it be desired, that the several subversions of the earth were the results of pre-established laws, appointed originally to act at determined periods, and that an unknown train of causes was originally laid; as, in me-

chanics, we can produce definite effects at distant and appointed times. But no such system will explain new productions of living beings: could even the seeds of plants be supposed to be preserved, the germs of animals could not; while we now know, what such theorists had not known, that the present world of plants is different from a former, and, probably, from every former one. There is no resource therefore, but to admit the special interposition of the Deity in this case; unless we deny the act of Creation altogether, by recurring to an atheistical system.

Now, the purpose of the present chapter is, to pursue this inquiry and extend this argument a little further; to see if the daily renewal of animal and vegetable forms does now proceed in consequence of pre-existing laws, or whether it demands the same creative power which formed the first model of every living being. I am quite aware of the difficulty of the inquiry, and not less aware that nothing can be properly proved; because the entire subject of life and organization is involved in mystery, or escapes our examination: from the minuteness of the latter, from the nature of its associate, Chemistry, and more especially from our entire ignorance of the nature of Life. But while, assuredly, they who maintain the theory of non-interference can prove nothing, this system is involved in far greater difficulties than one which supposes each new being to be as absolute an act of Creation as the first, as far at least as concerns the attachment of life to an inchoated or barely commenced organization; while a balance of difficulties is equivalent to one of probabilities. And should the compared mass of difficulties on the opposed sides, render the latter view acceptable or probable, it will then follow, that there is a perpetually governing Pro-

vidence, at least in this particular case : or, literally, that He who once created the living world is creating it daily by His will or word. Yet, when I say it will follow, I do not mean that it must be believed : because only what is proved ought to command the belief of reason. But it should induce the belief of those persons who similarly believe in those attributes of the Deity to which no absolute proof can be applied, or influence those who are, in the same manner, governed by probable moral arguments to believe what has been revealed, in those cases where this does not admit of proof, in the rigid sense of that term.

On the side of those who maintain that an original law, apart from all special or new interference, perpetuates all the beings of Creation, I can perceive little but the mere assertion : and when an attempt is made to explain this further, it evaporates in unmeaning terms and phrases. These, indeed, appear to have a meaning : but it slips from us when we try to investigate it. I must here, however, note, before proceeding, that while, for obvious reasons, I shall refer chiefly to the seeds of plants, the question is supposed to be freed of whatever is necessary to the fertility of the germ ; while, to grant the needful power to this, would be to admit that Chemistry can secrete life.

Now, the little form within the seed, consisting of a leaf, or leaves, and a radicle, is the germ, destined to become the successor to its parent. If this is the produce, for ever, of a pre-established law, one of two solutions is necessary, as each has been given. Either the Creator, when He made the original plant, placed within it, all its germs for ever, in continued and involved succession, and all the new lives and forms are only developments and enlargements, or else those

germs were not thus created originally, but a power was at first given to the plant, of producing them in this manner for ever. I am not aware that any other explanation has been offered or can be given: I may examine each of these. They are given as physical facts or physical laws: they must therefore be subject to physical examination and analysis: and if the theories have not done that, it is my business to do it, that we may see how they bear the examination which they provoke. We must not, as is always done, rest satisfied with a phraseology possessed of an apparent meaning; the general cause of the success of all hypotheses, as it is the common cause of that indolent ignorance so widely prevalent in what is termed philosophy. Did men think when they speak and write,—I might say, did they know how to think, did they even examine and master the facts which they suppose themselves to know, very few indeed of the hypotheses which have inundated the world, in everything, could ever have existed.

The first of these hypotheses is a physical fact, if it be a fact at all, which reduces itself to a simple question of infinitesimals; and thus it may be analysed. And I must present it tangibly to the general reader. We talk, currently, of the infinite division or divisibility of matter, yet with very little attention to the meaning or the facts: and if we sometimes pursue the latter in our minds, through the minuter parts of insects, or through microscopic animals, we become weary, and abandon the subject.

If the germ of a seed, be it that of an oak, does not contain the concealed form of every branch and leaf that it is ever after to produce, and that these are formed by the organic actions, it still, according to the

theory, contains at least one similar germ for the next tree : it is but to embarrass that at the present stage, with superfluous difficulties, to suppose more than this. And containing one germ, it also contains many ; because the annual produce consists of many germs inclosed in their seeds. It is indifferent whether we take a plant of large or small germs, of few or many seeds : the infinitesimal analysis will soon reduce all to a similar level.

They who desire a rapid series may contemplate first, the single seed of a moss, and count or conceive the whole number of those which such a plant would produce in one year. In this case, the germ which is supposed to contain ten thousand germs of the first year, is, itself, invisible ; and of what size therefore is each of those ten thousand ? Yet to pursue this theory as it has been given, each of those contains ten thousand more ; or there are ten millions of involved and pre-existent germs, at this initial stage alone, contained within that which is an invisible magnitude. To pursue it for a few generations more, reduces the question of magnitude to a quantity which numbers can scarcely express, and which ceased to be comprehensible long before ; yet of this inconceivably minute dimension must have been the germ which produces such a plant to-day, though the original had been created but a few years ago, if this was the proceeding of the Creator, if He exerted the act of Creation but once, or if such a definite self-acting law is the cause of the perpetuation of organized beings. But if we retrocede to the received date of our Creation, and further, infer the future duration of the present earth from those lengths of its past conditions which Geology furnishes, under some kind of approximation at least, we must carry on this infinite.

simal division, for the original germ, to an extent which it is quite idle, even to suggest to the imagination. It is in vain to say that we form any comprehension of a hundred millions of seeds contained within any germ of any plant: no one comprehends the extent or meaning of even a million, though these were visible objects: it is a word, and no more. And in the language of mathematics, not limiting, as we cannot, the future duration of this earth, we may say that the germ of a moss must originally have been created less than the least assignable quantity: while the conveyance of this series is far different from that approximation of an asymptous to an absciss, in certain curves, which is commonly used to convey a tangible notion of endless diminution; since it can find no illustration in geometry. We know not, it is true, the magnitude of elementary substances, so that they afford no comparison: yet as far as we can form any conceptions on such subjects, we can conceive the minuteness of the original germs to pass even beyond those boundaries.

I have dwelt on this analysis beyond all necessity to mathematicians: not so, I believe, to ordinary readers, to whom ideas must be fairly and fully presented and expanded. It is too easy to read without thinking; and the writer, in such cases as this, must compel thought, even at the hazard of superfluity. Teachers too often forget that they were once learners: and if the palpable absurdity of this theory has never struck its reader before, it has been for want of such an analysis.

But the long currency also of this hypothesis, with the weight of authority by which it was maintained, demanded little less than such a minute exposure of its impossibility; especially as it still possesses a wide in-

fluence over those who read more than they think, forming no small mass. So determined indeed were Reaumur and others to enforce it, as even to have maintained, that in the case of the Crab, as I have noticed in the 29th chapter, an egg, or the germ of a new limb, has been originally prepared, and placed at the point whence the lost one is to be renovated: utterly forgetful of the infinite absurdities that would follow by supposing this to be true of every similar case of renovation in plants and animals. But men, it is to be presumed, who write thus, do not think.

Of this nature is the difficulty, which besets the theory of original germs; of a law once thus established by the Creator: it must remain for the reader to choose between that, and repeated exertions of Creative power, unless he should prefer the next and only other hypothesis. Nothing is impossible to God, it is true, until it becomes self-contradictory: we know not that this mode of operation is such, and do not even know how to think respecting it, transcending, as it does, our faculties: yet, at least, it may be said that we make a certain and enormous difficulty, ourselves, to avoid what is only an assumed one, namely, that the act of Creation is not, or cannot be, renewed every day, by the special will, and therefore under the perpetual government of the Deity. This is the balance of difficulties, if any one will think it such, which I commenced by suggesting: belief cannot be compelled, because there is no proof; but, to decide on the superior probability, remains with every one.

But this is not all which the present hypothesis demands. I shall be obliged to show immediately, that life cannot be the produce of Chemistry, and therefore not of organization; so that I here take this point as

proved. It is therefore necessary that a distinct life should have been attached to each germ, from the beginning, under this system of successive involution: because, to confer it at a future time, at that in which it begins to develope itself as a new individual, would be a work of interference, and therefore of Providence: so that the question would be equally yielded. I do not say that this part of the hypothesis involves the difficulties of the former one, since we believe that life occupies no space: yet it is at least a sufficiently inconceivable supposition.

To turn now to the next hypothesis. If the germ was not originally created in this manner, under continued involution, a plant has the power of producing them, as it produces branches and leaves, through its own actions: or this is the law under which the Creator of the first plant has appointed that it shall be continued in succession. Now the production of a new part, in a plant, is, like the mere enlargement, the result of an organization put into action by the unknown principle of life, and causing certain chemical decompositions and recompositions. If such organizations thus acting, can produce a leaf or a flower, they may also produce a seed and a germ: difficult as it is, here, to comprehend, how a course of chemical actions, under pure chemistry, producing only peculiar substances, shall always, and in each special case, dispose of these in certain definite forms, and generate for example an oak or a moss, or that primary organization which shall terminate in these.

But admitting this to be insuperable, and therefore to be received as a mysterious fact, or law, appointed to each organic germ, or to each specific principle of life, the ulterior and essential question still remains. The germ is thus produced, but whence does the new life

come? whether that principle be the same in all forms, acting only through the separate organizations to which it is attached, so as to produce different plants, or whether it has in itself, a distinct power in different cases, influencing the chemical actions to proceed to certain defined results. Chemistry, little as we know of its intimate nature, is, at least, not life, nor does it produce life. It is for ever acting on inorganic bodies, without such a result: and we have no reason to think otherwise of it than as a mode of attraction, operating in conjunction with modes of heat, that appear to be repulsive powers, and acting on elementary or other matter. As I have formerly remarked, unassisted Chemistry destroys organization, both in plants and animals: or it demolishes that machinery which it had originally produced, under some foreign force, or direction, as soon as that force is withdrawn: as also, acting on particular approximations of other compounded bodies to such machinery, it destroys them, in spite of the directing power which life had before exerted over it. Or, otherwise, Life produces ultimate motions in organized bodies, which govern the chemistry by which those are formed, and augmented, and repaired; or, through the aid of chemistry, it produces and continues organization. Chemistry therefore, though it may maintain life, apparently, inasmuch as it maintains the organization through which alone we know of its existence, cannot produce life, since it cannot even produce organization, without the directing power of that mysterious agent. And therefore organization does not produce life. That it should produce the very thing, or power, by which it is itself produced, is the palpable contradiction, not to say, absurdity, which I have had occasion to notice more than once: to honour

it with the appellation of illogical is to trifle with the very term Logic : yet of such have been the reasonings and the logic of physiology.

Supposing it therefore admitted, that the germ is not originally implanted, but produced by the organization, and therefore by Chemistry under the directing life of the plant, whence comes the new life or principle of life which is attached to each germ ; an insulated and separable power, with a new and distinct identity ? Life, secreted by chemistry, and deposited in a germ, is unintelligible ; because secretion is a chemical act, and this power acts only upon matter. Were even Life said to be matter, or a mode of matter, as such metaphysical propositions have been maintained, the difficulty is not in the least removed : nor is it diminished one jot by the hypothesis of the physiologists, that it is the result of organization. In any case, the governed and directed power must still produce the governing and directing one : and though the difficulty, as thus stated, is metaphysical, it is not only equally inexplicable, but contradictory in the very terms, and therefore in the class of "absurd" conclusions.

Thus we have travelled the not unusual round to which all these inquiries lead us ; to the question of imparted life. And here we are compelled to stop : because here we have gone beyond the limits of our knowledge, and probably beyond those of our faculties. Yet the investigation has gone as far as was required for the present purpose ; and the desired result is attained, in as far as the subject admitted. Any law of organization, it shall be either hypothesis as the reader pleases, may produce new germs, or new organizations ; but it cannot impart new lives. And under this view of the successive production of germs, we cannot con-

trive a theory by which the Creator should, may we say, could, have imparted these for ever, through an original law. The organization does not perform this : it is not the work of Chemistry. Under the theory of continuously included germs, we might have supposed continuously included lives, as I have said, since life is without magnitude. But if the germs are entirely produced, we can form no conception of a pre-established insertion or involution of lives, under any mode, in the first plant, because we know not where they could have been placed, to what substances attached, or how disposed of for future and successive secretion or separation. We have no conception of life but as attached to matter : let him who proposes a theory of originally ordained lives, to be developed for ever, assign the attachments, or place, or mode ; or else, at least, render the hypothesis more intelligible before it is again promulgated. Thus much may be fairly demanded of every hypothesis : the present question is asked of this one, as the solution of the infinitesimal difficulty was proposed to the other. If an hypothesis is deficient in its very essence, it has never been thought to merit reception : and setting aside the particular nature and bearings of these two, they are deficient, as merely philosophical hypotheses, even to nullity. A law is said to exist : but, not only are its details and its execution not shown, but it is shown on the other hand, that its application, or even its existence, is scarcely consistent with possibility, or at least, that it is inconsistent with all our knowledge and all our powers of conception. Such hypotheses, or such proposed laws, are rejected by philosophy at the first instant of examination ; and I see nothing that can exempt these from the general usage which passes over,

rather than condemns, whatever is so vain and null. Were the admission of a governing and acting Creator not the opposed side of the dilemma, it is a question that would not have been entertained for an instant. Philosophy would simply smile at the proposals and pass them by; and it would treat both in the same manner, for the same general remarks apply to both.

Now, not like Theologians, but like philosophers, and omitting all consideration of the special object here in view, let us compare these systems with that which supposes a perpetually governing and creating power, as it was once an ordering, and, admittedly, a creating one. The main difficulty is soon overcome, on the broad grounds of experience. And it is this; since I have no desire to diminish it. Everything is utterly inexplicable. Of life we know, essentially, nothing. We cannot even conjecture what that power can be which occupies no space, and which, yet, as an individual power and life, without parts or magnitude, as that which is not matter must be, is practically bulky, or extended; since it animates and governs a large space, of many parts: and which, though an unity of the least assignable magnitude, in a germ, is not only extensible but discernible, as it is in the plant producing new individual lives by division. We cannot conjecture what a power can possibly be, which may lie dormant, almost without limits, even in an appropriate organization, waiting indefinitely for chemical aid before it can act: what that can be which disappears as it came, we know not how, and even when the organization to which it was attached, and which it acted on but an instant before, remains unaltered. And as little can we conjecture what that can be, which seems to give rise to new and similar organizations,

similarly insulated or insulable, and to thousands of distinct and constant organizations, all ready to perform, and performing successively, for ever, precisely what the first one did, and nothing else, and all controlling chemistry. But I need not accumulate difficulties. We are sure that this incomprehensible entity, Life, exists, or we could not, ourselves, be : we are sure of all these properties, at least, of this entity, and we are no less sure that the Deity gave it, once at least, or to the primary organizations, though the subsequent ones may be asserted or imagined to have received it in some other manner. Or, this He did, unless we recur to the system of pure Atheism, which we need not, and which if any one is now resolved to do, it must be a matter of considerable indifference, since such a person cannot be reasoned with. But, writing to those who can connect two propositions, it suffices to say, that what the Creator once did, He may do again.

In the strictest philosophical view, this power may be assumed and applied as we here wish. Experience shows that there is a power in nature that can give life : and experience is, in philosophy, all that we ever have to reason on. We see and know no more of magnetism, as an entity or power, than we do of the Deity ; but, from experience of its effects, we admit its existence and its action. The power which gives life may similarly be viewed as if it were some unknown thing, as if it were light or attraction : or we may make use of it just as we do of an unknown quantity in mathematics ; drawing deductions from its actions, and extending these from one class of phenomena to another. Such is the usual train of philosophical reasoning. This power once gave the principle of life to a large number of organized beings : we find it given again,

in succession, to many more: we know of no other power which has done this, nor can we even conjecture one capable of doing it. If therefore I conclude that it is daily performed by this power, it is but one of the usual and admitted inferences of philosophy, from experience and analogy. Such reasoning has always been received as sound, and the conclusion as legitimate: in the case of magnetism, there would not be a moment's hesitation.

But, had this reasoning no other object or purpose, it is the solution of a great philosophical difficulty, and ought therefore to be acceptable. In all other cases, we are thankful for such solutions: in no other do we ever seek for an imperfect or an improbable one, when we have a better: we have seen that every other is worthless; and therefore, even on these grounds, philosophy should adopt what has thus been inferred. Yet we are to reject this solution, because the inferred power is that of the Deity; because it is God. Philosophy grants it to be an effort of power, and yet rejects the only power that can effect it: it has even proved and admitted the fact in the first and the essential case, and yet denies it in the subsequent ones. And why? Not because this was more difficult in the last than in the first; not because it possesses a better solution, not even because it does not believe in a God creating, but, because it chooses to think that He does not govern, or ought not to govern, what He has created; because He will not, or ought not, to create again: not, I presume, because He can not. And why does it conclude thus, thus limit Him, thus dictate what He ought and ought not to do; thus pronounce on His will, and thus will for Him? Is it that we are superior in judgment or intelligence, that we could govern His world better than Himself, appoint better

laws than He has appointed? Or is it that we wish to save Him trouble? since even that has philosophy thought unfitting for His nature. Or is it possible that we should desire that He were not the governor, as He was the Creator?

The last has been a very general accusation, rather than a suspicion. I think it has been often, if not always, very unjust; but I am sure that it can produce no good effect, and ought to be avoided. Under the views of Natural Theology at least, the appeal is to knowledge and reason: and the force of an argument is not increased by the excitement of the feelings or the display of temper. How far the contrary practice has been of any use in any other question connected with religion, it is not for me to inquire. My duty, here, is to adhere to the simplest view, and to approximate the reasonings, as far as the nature of the Deity admits, to the ordinary proceedings of philosophy.

But it will now be useful to give another view of an argument which requires some expansion, for readers not used to investigations of this nature. I must commence by repeating, that there can be no essential difference in Creative power, whether life is attached to an organization fully formed, or to one in its germs; since the ordinary processes of chemistry, under life, convert the germ into the full-grown machine. They who have not reflected on these subjects, misapprehend this question. Thoughtlessly, or rather ignorantly, it is esteemed an act of Creation, exclusively, as of extraordinary power, to have produced an animal or plant, fully grown, and endowed with life. By common minds, it is looked on as little else than a miracle; the miracle of creation. But this view is vulgar and false: the miracle is equal, that the oak is produced from an object

in which little form can be traced, and no probable indication of the ultimate one. After this germ, be it produced as it may, Chemistry does the rest; while the Creator in ordaining this power as His agent, has merely commanded it to perform slowly, at present, what He, at first, executed quickly, or at once; and, surely, by the same means; since the process of constructing an organization is a chemical one, and we admit that He works by means. There is no other difference: difficulty is not a word to be used; and miracle there is none, otherwise than as Chemistry itself is a miracle. Thus also, they who profess such anxiety for maintaining laws of nature, can see that the law of nature on this subject was, or might have been, followed in the creation of the first man: since He who appointed Chemistry might have modified its time, or mode of action, without infringing on its essential nature. Under this view, the Creator gave life to a germ which He had willed and had formed from elementary matter: and overstepping the bounds of time, produced it fully developed in one day, or in any other short space; while the power of thus acting under laws of His own appointment, even philosophy will scarcely question. And though the whole process were simultaneous, it is not the less a process, with Him to whom there is no time.

I have thought it needful to state the question in this form, for the sake of those who, considering the first creation as a miracle, as a special breach of the usual "course of nature," are unwilling to admit that the Creator will perform similar miracles daily. But if He willed the first organizations in their full stature, and then gave them lives, the main argument is not affected, since it is the giving of life, whether to a completed form or a germ, which is the essential fact under this question.

To pursue it in this view, He does not now command His chemistry to produce the full organization at once, or in a short time; while there are obvious reasons why it should not be so. It may even be true, that without further interference, He has established trains of actions through which Chemistry should, in certain organizations, produce new parts, or germs, capable of carrying themselves on to the parental forms, under the power of life, ruling Chemistry, so as to complete, in time, that which He at first completed in an instant. Yet if to those, He himself does not add the principle of life, respecting which all that we shall probably ever know is, that it is His gift, we cannot comprehend how it does arrive there, or how it is produced. It was not pre-ordained and pre-involved, as I have shown; neither is it the produce of organization. Therefore it must have been given, allotted or produced, in time, or in succession: not from the beginning, and far less from eternity. It must have been thus given also, if it cannot exist without a special place and attachment, as an individual life; or even if it could thus exist, it could not have been appointed to a place and an organization until that was prepared. The germ therefore being prepared, and posterior, the life was attached, in time, to that part or point, let it have existed, in some mode, from any time that it may, or let it have been a detachment from the original life. This act was one of power, or it was the act of the Deity, since there is no other power to effect it; and being an act in time, it is one of interposition.

And this is Creation. It is indifferent whether the living being is created in its complete state, or in its germ: in a rigidly philosophical view, the creation is the same; differing only in rapidity; while for those

two modes of proceeding, the reasons, as I have just said, are obvious. And it is indifferent though the new life should be separated in some mysterious manner from the original one ; since, not being the act of Chemistry, or of a blind law, pre-established, it is equivalent, as far as interposition is concerned, to the creation of a new life.

The general conclusion therefore, and under philosophical views, seems to me this. Originally, the world was peopled, if we believe the record, by full-grown forms ; while there are evident reasons for such a proceeding, though we did not choose to give credence to that history. Yet, (and it is here an important remark,) perhaps because of that very record, such is the force of early impressions and of habit, even of that philosophy which does not often perceive it, we have accustomed ourselves to consider this as the only act of Creation, as we have used ourselves to look on it as a miracle, when it is but one mode of the exertion of a power which is exerted every day and every minute, and in almost the same manner. It is, in reality, a distinction, under a difference which is an essential. The daily production of a plant or an animal is the same thing, as far as it is an act of power, and it is an equal miracle. The process may be slower than it once was ; but each is equally an act of Creation. He who produced full forms, possibly in an instant, possibly in a short time, (for of this we know nothing and are told little, otherwise than as notion of a process of formation is suggested,) and who having formed them, gave them life, now produces germs appointed to enlarge into such full forms, and, for that purpose, He also gives them lives. Assuredly therefore, if He acted then, He acts now : and since we do admit that He did thus act at the beginning, we must equally grant that

He does act now, and therefore, that He interposes, or interferes, "personally," in the management or government of the world.

Thus ever interposing in the direction of the physical universe, His government thus far is established : and such conduct is His Providence. It is this, in every sense : because, if He acts, He may will not to act ; and if He chooses to change, or to do what we have not expected, who shall control Him ? It is thus at least as to the physical creation : and if we ask why He attends to what we choose to consider trifling, why then did He originally create what we must look on in the same light ? He did not think so then, at least : He cannot think so now, if He creates new lives daily ; and wherefore then should He think the subsequent care less important than the primary one ; why ought He not to superintend, to protect, to govern, what He is for ever creating ? Man, at least, never yet acted thus : if he did, we should even doubt his sanity. What can he possibly imagine, when he thus judges of the Creator ; of God ? The difficulty at least will not be urged against Him : if the want of interest is assigned, then cannot we conceive why He should have created that which He has done.

But these physical forms are not merely organized machines, simply governed by life to certain mechanical ends and results. They are sentient beings ; they feel, and think, and will, and act ; and they are happy and enjoy, or they may be otherwise, and suffer. And He made them capable of all this, as certainly as He made them the mechanical machines which they are. The machinery of mind is as surely of His creation as is that of body, though we cannot measure and weigh it. Whence then, if He created the sentient machine, does

He not care for and superintend it, as He does the corporeal one, and whence, far more, (to repeat an argument used before,) when the very end of the latter was to be subservient to the other ? To conclude otherwise, may be to conclude as philosophers have done ; but it is a conclusion against which a sound philosophy has for ever set its face, since it wars against those rules which even an infant in its logic would shame to break.

But what more ? If of all that belongs to His sentient creation, to that inappreciable and invisible Entity, Mind, the moral sentiments and the intellectual powers stand in the highest rank, does He forget or neglect them ; does He not watch, superintend, govern them, and that entity to which He has appointed them ; above all, does He not most care for that peculiar entity, that mental machine, to which He has allotted them most largely ? Is man, are men, the things of His creation which he has peculiarly resolved to forget or neglect ? Is there an existing man who can believe this, and at the same time believe that he is performing an act of reasoning ? Can his Creator avoid to care ; can any man of sound mind conceive that He is not the moral Governor of the world ? Is there then not a Providence in every possible sense of that term ? And if He has given an immortal principle to that being for whom He has at least appeared to care most, and cannot therefore in reason fail most to care, is there not that Providence also which religion teaches us, is there not the God of Revelation ? Even philosophy compels me to believe this : and who shall dare to doubt it, and still call himself a philosopher ?

I have had occasion to use this argument before ; and can only regret that my inevitable plan deprived me of the means of examining this great question in a

more full and connected manner, by treating of the government of God in the world of Mind. In this department, as in the physical universe, there must be an organization, as far as that term can be applied to Mind, and there must be laws: while, be the difficulty of assigning those what it may, and great as it assuredly is, as it has ever been, there is much that might be traced or inferred, with sufficient security for the great purposes of a work of this nature. I need not indeed regret this omission as far as the proofs of the Divine attributes here selected for illustration are concerned, since the physical ones are ample; but it may be regretted, as far as the great questions of morals and religion are implicated. Yet, as I formerly insinuated, this is not a subject to form a small portion of a work already too large; while it must be left to him whose plan may be so exclusive as to relieve him from all constraints of space: as I trust that he who shall undertake it will add sound metaphysics and solid logic to ample information in the history of man, in politics, and in morals, to a luminous mind displaying itself in a clear, condensed and luminous style, and above all, to a genuine and sound piety, and warm as sound; while divested alike of theological prejudices, and of those hypotheses in religion which are the bane of all reason and all reasoning.

But if I have terminated this argument, I cannot quit the subject of Creation without another suggestion, if I dare not call it more; viewing it, as I have ever done, under the present light, or as another argument for a superintending Providence: and still considering, that if ever it shall be proved, as I surely cannot yet pretend to prove it, a new ground of reasoning will

be gained as to the perpetual government of the Deity. I am fully aware of the surprise such a proposition will occasion, even to philosophy; and still more so of the reception which it will meet from those who consider the Sacred History as a designedly full and true record of all that belongs to physical science, not less than of those moral acts and purposes for which it was assuredly intended. Yet, to this, the answer would be but that which I have elsewhere suggested for Geology, as astronomers have long since done for their own science: since it must apply to the history of organization, as to all else under physics. I know indeed that this will be no answer now, as all are sensible of the reasons: but philosophy must not shrink from declaring what it thinks to be truth: above all, in such a cause as this, for it is still the cause of Religion.

Philosophical Atheism has ever wished to believe in what it has termed equivocal generation; as its object in adopting this hypothesis is evident. That speculation is fully answered by the former remarks on life and its production, so that I may pass it over. If it has produced facts in support, they are the very ones which would have availed to the present view, had they been better founded: and I have only to regret that I cannot add to them so much as I might have wished.

Yet it must be remembered, that if natural history has perpetually opposed this doctrine, it is not because it could produce the parents or the seeds, in these cases, but equally because of its hypothesis. It has assumed, under the not unnatural prejudice to which I have just alluded, that the creation of organized life was completed at once, for ever: and therefore it has not sought for facts, or has refused them; as the same feeling still

prevents it from seeking for them. Nor was it to blame while it thought itself opposing the atheistical philosophy: it may perhaps become willing hereafter to judge otherwise, should it consent to believe that the Deity is daily directing the whole course of the universe, by His absolute interposition, and, that to create organized forms now, is consistent with His plan, or a portion of that very government.

Why should He not act thus? This is the metaphysical and *a priori* question. There is no answer to oppose, unless there be an absolute record on authority to the contrary: since Natural religion would answer, It is probable. And if there is no such prohibitory and positive record in the cases of astronomy and geology, there is none here. In the sense in which I have formerly used that term, He does create new systems, or new planets, now, and, doubtless, He replenishes them now with animals and plants, as they become fitted for that purpose. This is a persistent, if not a daily creation, though it does not happen to be in one spot, or in our own earth. But He has also created life in this very earth, repeatedly; so that its organic creation is not at least the produce of a single act, even here, never to be renewed again. On what grounds then are we entitled to conclude that He is not doing the same thing, or rather, that He cannot or ought not to create, annually, or daily, if such a proceeding is not inconsistent with His plan; above all, if it is consistent with it, or necessary to it?

We have no reasonable answer to such questions, even when deciding as natural history decides: while it forgets to see that it is inventing a mode of conduct for the Creator, and tying Him down by schemes of its

own. But even they who argue from the record which they use to oppose this doctrine, are compelled to believe that He has actually proceeded in this very manner when there was occasion ; that, since the original creation, He has created animals, and in considerable variety and numbers. He did so, because He had a purpose in view ; and who of us is there that knows all His other purposes, and can say what there is which He is not doing ? We call the cases of Egypt miracles ; and they were so ; but they were still acts of subsequent creation for special ends, and therefore as much in the "course of nature" as the original creation of animals. And being acts for an end under His plan, why may there not be similar acts for other ends belonging to the same plan ? And if I can see no answer, either from reason or religion, to these questions, I may proceed to inquire, as on many former occasions, of the end and the plan, or of the probable utility of such a proceeding ; since I have amply shown, all through this work, how we learn to trace the conduct of the Deity through final causes, when we can find no other possible clue to it. And if I can show a final cause, or any objects justifying such conduct by their utility, then, as in other cases, it becomes probable, and the facts which bear on it will meet with the readier reception as proofs.

If an island like St. Helena were now to rise from the sea, it ought to be replenished with some life, both vegetable and animal, in conformity to the Creator's general design. Islands are thus formed now, from Coral ; and the answer might be, that all these have been replenished by transportation. I might admit it also, and it may perhaps be true : but if it were, it is

but in conformity to a general principle pervading all creation ; under which, a single proceeding, or mode of action, or even form, is extended and modified as long as it can be used to attain the end. And if I cannot doubt, that should the system of transportation prove insufficient, another would be adopted, rather than that this primary purpose should not be attained, so is it yet a question among botanists, whether St. Helena does not actually contain some plants which are unknown elsewhere, notwithstanding the general resemblance of its vegetation to that of the Cape of Good Hope. And though the Syngenesious plants possessed of flying seeds should predominate, it is scarcely conceivable that it should have been clothed by transportation, when its position is considered, whether through the atmosphere or the ocean : while, as far as its plants produce adhesive burs, we see no facility afforded by them in this peculiar case. It is also by no means as yet ascertained that all the vegetation of the Coral islands is the produce of the well-known transportable seeds and fruits which have naturally attracted the first attention. And I may, in this specific case, again ask the question ; why not ? St. Helena is as much an act of creation as a plant is, and the Coral islands are acts of creation ; and why then must the Creator be deemed unwilling to produce a plant now, when He has wrought to produce an island ?

If I might protract this *a priori* reasoning respecting the Creator's plan, or the purposes of utility to be served, I need not do what would but prolong this portion of the present chapter : while these will appear, in proceeding to state the facts which seem to prove a perpetual system of partial creation ; as the reader who has gone through the former parts of this work, can

find no difficulty in applying this species of reasoning himself.

If the insects and other minute animals of the recent islands of the Pacific are yet but little known, it seems at least ascertained that the snails of Otaheite and the Sandwich islands belong to a genus, (*Achatinella*,) peculiar to those places. When more accurately examined, it will be seen whether there are not many more analogous animals incapable of transportation, even to the flying insects, of which so few have been collected; while I know not how the vanity and obstinacy of this science, such science as it yet is, will account for the transportation of the lizards which abound in so many of these new islands. But, of this, and much more, natural history will be more inclined to inquire, whenever it shall learn to doubt the necessity, not less than the truth, of its former hypothesis. I may note some of the cases, of ordinary occurrence, which present difficulties that have ever been felt and never yet overcome: while no one has ever asked whether we have not hampered ourselves with a gratuitously fundamental one, under an imaginary necessity. Yet to the causes already stated, I might perhaps add the ancient well-known maxim, "omne animal ex ovo;" since I need not say how persistent is the influence of proverbial and terse expressions on the human mind.

The production of the Infusoria has ever been one of those difficulties, as it is among the most conspicuous. It is in vain to say that the eggs arrive from the air. No egg, produced in water, could quit it, to be wafted in the atmosphere, and again deposited in water: and though this could be imagined, many of these animals are viviparous, under which form the answer is absolute. It has been said, as another mode of explanation,

that the eggs are existent in the vegetable matters infused. It would be difficult enough to comprehend this, for the same reasons : since the egg must equally, in this case, have quitted the water to seek the vegetable through the air, or else the parent must have laid its eggs when itself is incapable of existing, and never yet did exist, when the instant of drying is not only that of death, but of disorganization. It is still more insuperable, were it needful to add difficulties, that the vegetable matter capable of producing animals may previously have been exposed to a high heat, sufficient to destroy all life, or that it may not even be a vegetable organization, but a new chemical compound, as in the case of vinegar and its Vibrios. But it is absolutely insurmountable in that of the viviparous Infusoria ; since in no manner could they have continued their races in such circumstances.

Here then, if anywhere, is a proof, from negative circumstances, as strong as the most direct ones could be. There is an impossibility, or surely what appears to be one, balanced against a rational probability, derived from high analogies, and under a final cause which pervades all Creation, or under the Creator's design for an universal and visible good end : while the impossibility has nothing to defend it but an hypothesis, the necessity of which is purely assumed, and on grounds that will not bear examination. It is a case of "equivocal generation," if there ever is such a thing ; but not in the sense of the atheistical philosophy. There were room and food for more animals : this is the final cause. These were the means of mere happiness : and throughout Creation, wherever this occurs, there are existences appointed to enjoy it ; while, if we see and read something respecting the mode and the times, we

have neither seen all nor been informed of all. Why should we ? Of nothing, has the Deity told us all, and, in nothing, has He permitted one man or one race of men to see all. And we have no right thus to presume, even on the grounds of the recorded and sacred history. That history has told us nothing of the prior creations which geology proves : nor was it ever held wrong to supply that which has not been told, provided that it does not contradict that which has. And such a supposition contradicts nothing : while it serves to impress us, still more strongly, with the power, the perpetual government, and the beneficence of the Creator, and is thus, not the enemy of Religion, but its friend.

The animals which inhabit the interior of other animal bodies present the same difficulty, under another form : and natural history, ever willing to find the solution in the same manner, has continued to vex itself with inquiries and theories, equally in vain. It has sought those which belong to open cavities, out of doors ; but if it has found the source of some, there are many more which it never has, and apparently never will. I need not name this disgusting tribe : but they who have thought of this subject know what they are. Yet though it had succeeded respecting these, it remains utterly at a loss respecting the Hydatids and other animals of enclosed cavities. Hence have they been referred to eggs existing in the circulation : while so unwilling have naturalists been to surrender their hypothesis, that they have never asked of the road such eggs must have taken, nor why they should thus be determined to those specific cavities or places, only. Above all, they have never considered how such a theory could possibly apply to the hydatids which are viviparous,

and in which the progeny also is of considerable dimensions.

If these two are of the most striking of the familiar facts, there are many more in the animal world, including some that I shall not name, as unfitted for a popular work. These I must leave to naturalists to reflect on: but I may at least note the familiar case of the Mite in cheese; produced in this substance, though taken in the curd, from immersion in water, where Mites never existed, where eggs could not get access, if they did, and hermetically enclosed at the very instant of removal. I need not repeat the false or doubtful cases of fishes and frogs and insects, quoted by ancient writers: though I can see no reason against such occurrences, were they necessary; while still repeating, that whatever can be effected by ordinary means, is ever intrusted to those. I may therefore turn to the vegetable world, where there is the same primary purpose, replenishment, besides other objects of utility which I have pointed out formerly.

The propagation of the Lichens through seeds has hitherto presented a difficulty little less than that of the Infusoria. These have been sought by the whole race of botanists, and with no small industry, to no purpose: whatever suspicion of their existence may be excited by the peculiar supererogatory parts on these plants, which have naturally enough been viewed as fructifications. It is at least singular that they have never been found within any plant of this extensive tribe, nor ever seen in the act of escaping. If I formerly suggested the difficulty of their adhesion to rocks, as wafted through the air, I there followed the received opinions, and reserved this doubt for the present place. I admit that if a Sphaeria is propagated by seeds, so ought a

Lichen, which is so often analogous: yet how is it that the shield or tubercle of a lichen was never yet seen to open, and that we can watch the same lichens for years, and for ever find them just what we found them at first? And if hundreds of such individuals, in many species, have not produced seeds, for all those years, whence do the seeds of lichens come, if they are thus propagated? If natural history cannot answer, neither can I, except under the supposition here in question.

The seeding Sphaerias, and other analogous ones, would seem to prove that this numerous and yet ill-arranged tribe of fungi must be propagated by seeds, and therefore, as natural history concludes, by seeds only. I do not see how this conclusion follows. A created being is created to propagate: but that is no reason why it should not be again created, independently, as it was at the commencement. The Infusoria all produce progeny, as they ought, under an analogy to all the laws of Creation, and because, should the place of their habitation continue, that mode of perpetuation is valid: but if the argument for new creations of those is of any value, so is it for renewed, or daily, creations of seeding fungi. Or, if these plants, whose useful offices I formerly described, are invariably produced from seeds, natural history must answer the following questions. Whence come the seeds of Boletus, or whatever else, on the burnt bricks and lime of our cellars, under no communication with the external air, and when there are no similar plants in the neighbourhood: whence are the Mucors and Trichodas on our cheese and paste, whence, above all, the Redwiedo on new-fallen snow, and whence the fungi of the "Dry-rot," appearing, like hydatids in the animal body, not on the outside, but within the organization? In this last case

naturalists have answered in the same way, that the seeds were circulated and deposited by the vessels of the tree; but they should explain how these gained access to the root, or to any absorbent of a plant. The "rust" and the "smut" present the same difficulties, and the question is the same; as it is a question that has not been answered. Is it not also the same as to the Vibrio of wheat, where the same solution as in the dry-rot has been offered?

I need not pursue these facts further, nor dwell on them. If natural history can furnish other similar ones, I shall be pleased to hear of them, believing that they will aid my own argument. But if I have also noticed the appearance of plants in ground where their seeds were unsuspected, attributing them, like others, to a dormant vitality, we ought not to be too confident in this solution, nor that the Creator does not command new plants where the circumstances are favourable and plants are wanted, just as He once, or rather, more than once, commanded them to clothe every region of the earth: since, I presume, no one thinks it necessary to believe that every plant of the world sprung from a single one, or to believe in that theory of their propagation from centres to which I formerly alluded. Why does not every one see that the whole of these theories are grounded on a desire to limit the power of the Deity, or to regulate His proceedings according to the views and prejudices of men? And why also has no one discovered, that the whole is but a portion and mode of that Peripatetic, but originally Oriental philosophy, which conceives or asserts that He acted but once, and then rested from His labours; though the doctrine is expressed in far other terms.

But I may quit this subject with the following

remarks. I do not believe that if a new island were now created, or raised from the sea, and in such a portion as not to admit of replenishment by transportation, it would be left without tenants: and if any one can believe this, he must believe that the Creator did not intend such new lands, nay, not even an earth, for life. And I do not believe, that if a new lake were produced by geological changes, it would be left without fishes, even though it did not receive these from previous rivers. The American volcanoes are more modern than the first arrangement of the earth for man; and there are subterranean cavities dependent on them, which contain the Pimelodes Cyclopum.

But the whole of our habitual opinions respecting the organic Creation require to be revised, since they are at utter variance with the plainest facts, as their imaginary foundation lies in what I noted before; the unnecessary presumption that where we are informed of something, we have been told all, and that also, on subjects which are in no respect essential to the great ends of the Sacred Record; which, on this special subject, is the history of Man, utterly distinct from the whole creation, as a mere animal, and so entirely distinct, in even a physical view, that organized and sentient beings have been created over and over again, long before he was designed, and without reference to him, as they are unnoticed in that record. And if I said that all the plants of the earth could not have sprung from original single individuals, or pairs, it is not less true of the rooted and immovable animals, including even the shell-fishes, beyond enumeration. If it is true of them, it is true of the fresh-water fishes, since no communication through all the rivers of the world can be conceived, applicable to animals now so

insulated and not found in the sea, though, in a geographical sense, that might be the medium of transit. Thus also must it be true of insects and worms beyond numbering, when the same species, and in thousands, are insulated in a thousand places, and when that insulation is complete for each allotment, from the impossibility of sufficient locomotion. But above all, this is true of the two great and distinct creations of America and New Holland, insulated by their very geography, and thus, as much proving the necessity of their own peculiar creations, under the plan of the Deity, as the facts themselves are confirmatory of the anticipations.

Our views have been wrong: we have forgotten what this plan was, though it is declared, like all else which Natural Theology deduces from creation, in language that cannot be mistaken. We have been prescribing to the Creator, while forgetting to read that revelation of Himself which is for ever before our eyes. Yet we intended well: we had but read imperfectly, and considered too little. Let us not be afraid to read rightly now, assured that truth can never oppose truth, and that God never presented it to our senses and our reason, and contradicted it by His declarations, though He may have commanded us to believe what was beyond their scope.

Thus we shall view the God of creation as what He truly is. He has created an earth for the ends of life and happiness, and He has filled it with happiness as with life. He created life when it was a far other earth than it is now, and He has created it again and again, to fill the successive earths which His wisdom thought fit to reproduce. He reproduced portions at later periods, as I have shown under those views of geology for which I must refer to another work; and again He cre-

ated life for those partial productions. He is now re-producing portions, if on a smaller scale; and I doubt not that He is now doing what He has thus done from the commencement, in consistency with the whole of His design and conduct. His creation never ceases for the habitation, and it ought not to cease as to the inhabitants, whenever that creation is expedient: since thus alone can He carry on His obvious design. Thus at least does it appear to myself: but whatever I may have hazarded by this view, no reader can have read thus far, without discovering that my own belief as to all that is recorded, is as ample and as firm as his can be. Were it not so, I should not thus have ventured or written.

And now I have but to repeat the general conclusion to which all this tends, but which would not be affected in the least degree, though it should be rejected. It is the extension of His direct and personal government, and therefore of His Providence; ever watchful over His works, and ever doing in the universe all that He ever did perform.

I have now ended with these two questions: if they have been protracted, I know not that I ought to regret it, should I have succeeded in producing some belief in what I have attempted to prove, though I should not have caused conviction. It is one of the most important questions relating to the attributes of God; and if also I am hastening to the conclusion of this work, I wish the reader never to forget the main end and purpose of the whole.

There still remains a question to which these discussions naturally lead: which, though I have often noticed it as circumstances arose, I never could conveniently have examined as it deserved; while it is especially suitable here, since the grounds on which it

seems to rest have been just discussed. It is the question of Materialism, as far at least as physiology is concerned.

It is not within my plan to examine this much tormented question under all its modifications : if I may apply a single term to that which has been so variously and loosely used. I have ever avoided the ocean of interminable and wordy metaphysics : and few require to be told of the philosophical ignorance and confusion which have attended this mischievous word, nor of the pernicious moral conclusions which have been engrafted upon it. The present inquiries are, properly, physical : and, as far as is possible, to such I must adhere. And, under that restriction, I may safely make, at least the following remarks ; though, as now to be applied, they are little more than an abstract of matters noted here and in other places.

Physical, or physiological, materialism has said that life depends on organization. It has said even this, when it has not always perceived what it was saying : not an unusual occurrence in this class of philosophers. It would be a very simple question to ask, in this case, on what does the organization depend, since, like all else, it must have had a cause. If it was caused by the Deity, I do not see what object this materialism has gained for those not good ends which most of these systems have had in view. If it be meant for Epicurism, I need not repeat the answers. Nor need I do more than repeat, that under simply philosophical views, and though there were no ulterior wish implicated, it is to confound the conceptions, as well as the definitions, of matter and spirit, of the thing moving and the thing moved. But the physiological materialists have not troubled themselves with thoughts of this nature ; as,

for the most part, they have not seemed to know of such a science as metaphysics. And this much at least I have so recently answered, that it is a pure superfluity to say, that since life is demonstrated to be the produce of organization through its power over chemistry, organization cannot be the producer of life. This is the illogical, or rather the "absurd" conclusion already pointed out. The principle of life is attached, demonstrably, at first, to some form of matter which is not an assignable organization, and it produces that machinery.

But, asserting somewhat less than this on other occasions, those "philosophers" said that organization produces mind or thought : admitting then, of course, that the principle of life is superadded to the organization ; though not often expressing themselves clearly, as, apparently, not exactly understanding what it is they do mean. If this is to be materialism, and intended for the same ends, they must explain what the principle of life is, if it is reconcilable to this hypothesis. I have shown that it is not material, nor produced by chemistry : and being such, then the animal is not a purely material being ; since it not only contains an immaterial principle, but since that is also the leading and governing one ; as it can be the gift of nothing but the Deity Himself. Thence this hypothesis is a nullity ; or Materialism is a mere term ; meaning nothing, if it does not assert a direct untruth, and an untruth also which must either belong to conscious design, or to the most discreditable ignorance. In no manner could it answer the intended purpose : since that immaterial principle may even be immortal, for all that can be proved to the contrary, because it exists when giving no proofs of its existence, in many cases which I need not now repeat.

And why should it be inferred that organization is Mind, or produces Mind, or thought? while even if it were the fact, the materialist could gain nothing towards his end, as long as there remains that immaterial principle which no power of his can set aside. At the best, it would be but a vain and purposeless philosophical speculation : it has not even this insignificant merit. The Life requires material organs by which to communicate with the exterior, as the basis of its conduct, and of those acquisitions by which it is, partly at least, rendered what it is. It may even require such organs for more than this, for what belongs to its more fundamental constitution, impossible as it is for us to conceive this : but when it can be shown how innate knowledge or instincts, moral dispositions, or whatever else there be in mind, of this original appointment, can be a property of matter, or be even communicated to a material organization, it will be time enough to admit of an hypothesis, which, as a mere assertion, might be perfectly answered by a counter-assertion, under the admitted rights of philosophy, though there were no better answer to be given.

But if it is said that mind, or thought, is the produce of life acting through, or on, an organization, I do not see why this might not be conceded, yet without the result which this materialism has desired. If the motions of organized matter produce thought, as has been asserted, such motions are still but intermediate agents, and must themselves have been produced, and produced also in all their possible modes, by the same primary and immaterial agent which is the demonstrated source of all motions in an animal organization, and which, in maintaining the ordinary organization, produces an infinite number of modes of motion, with corresponding

varieties of result, as I have formerly shown. Hence then, organization does not produce the motions required for thought, although we should grant that asserted fact, but suffers them; or matter is not, under any form, the primary and the true cause of the actions which constitute and demonstrate mind, even under the showing of materials in itself. It is therefore, once more, an unmeaning term, or a false or an ignorant supposition.

All that follows, even on this view, is, in reality, but that to which I have just alluded. The immaterial principle cannot demonstrate itself in acts of thought, without an adequate organization, or, which is the same thing, animals have been so constructed, and under the most obvious necessity, when their purposes are considered, as to demand material machinery for the ends and demonstrations of mind. To a spectator, the presence of mind is only known through the sensible movements of a machine, because that mind communicates with the exterior but through its senses. If we ask whether that might not be known to the individual mind, without the necessity of the machine, or why that machinery is necessary to consciousness, the answer is one that shows us that we have travelled, not simply beyond the limits of metaphysics, but of our own conceptions. There may be a mind without a body, capable of all the internal actions of consciousness; but it is vain to say that we either believe or disbelieve it, since we cannot understand it: it is, to all purposes, a trifling or a null question, because we can conceive nothing that we have not experienced, and simply know that we include mind and body. And if physiologists have held it as an argument in their favour, that the powers of the mind fail with those of the body, what

more would it be than to say, granting it to be universally true, which it is not, that the needful machinery of reception and demonstration, or of use, is deteriorated: while it is but a parallel to the case of the dormant seed, or to those of hibernation or sleep, or whatever else of analogy there is in the animal system.

The materialist ought to be now answered, on every ground; while he cannot, with every concession, even construct his own system, so as to be intelligible, and to serve his purposes. But I may still say, that if there is to be a choice between the organization and that immaterial entity, life, which first produced it, and continues to govern it, as the ruler of chemistry and matter, it is a very singular philosophy which chooses to seek in the dead and passive elements which this has arranged, although combined into a machine, that active power, the power of mind, which mere expediency, or the most common dilemma, would have taught the weakest reasoner to look for in that which has so fully evinced its command over matter, and as an immaterial power. If philosophy reasoned so inconsistently and obstinately in everything else, it would be that just object of ridicule in every thing, which it has so often and so justly been in very much, through all time: yet it seems to think, not only that it can safely reason thus wherever the Deity is concerned, but even prides itself in then despising all logic: as then too, especially, it seems to find supporters. Yet it is an unmerited compliment to physiology and its reasonings, to dignify them with the term philosophy, even in its worst moods: and the maintainers of this hypothesis have at least acted consistently, since their views had never extended beyond their own poor scope, in observation and reasoning; beyond that which has hitherto

been the philosophy of Medicine, of that science which sprang up in the days of a false philosophy, and forgets, even yet, to note that what has been so long rejected by all other science, ought long since to have been condemned by itself.

But this, equally puerile and impertinent hypothesis, has been, like much more in modern philosophy, the produce of narrow minds, conversant only with an equally narrow range of facts : priding themselves on what they have supposed to be their own peculiar knowledge, and proud too in thinking that their facts are more accurate and numerous than those of their remote predecessors. Not less proud, moreover, in appealing to him whom they do not comprehend, to Bacon ; while unaccustomed to reasoning, as true philosophy teaches to reason, and ignorant that without this, facts or experiments are nothing, or worse than nothing ; as that sound reason will draw juster conclusions from one fact, than they can do from thousands. The anatomical knowledge of Cicero was, doubtless, inferior to that of the modern physiologists : yet I may safely leave it to my reader to compare his conclusions with theirs. “Animorum nulla in terris origo inveniri potest :” “his enim” “nihil inest quod vim memoriae, mentis, cogitationis habeat,” “quæ sola divina sunt : nec inveniatur unquam unde ad hominem venire possunt nisi a Deo.”

I might easily produce further arguments to the same purpose : but what is done is done. If I add the usual metaphysical answer, it is rather that I may show what its real nature is, than on account of its peculiar value. Matter is inert, and being so in one particle, no multiplication or arrangement can make it active : the watch has no more activity than a fragment of brass :

it moves only under a foreign force. This, however, it is plain, is only an identical argument: for the definition of matter has done all before. But it is not unusual with metaphysics, to travel through volumes in the same manner: leaving it to some one else to discover, when all is done, that the definition is equal to the folio, or that a better one might have saved it; or else, as has been truly said, that it has fabricated a large wound out of a pin's puncture, for no other purpose but to heal it again.

As the general object however, of this materialism, if not the universal one, has been to produce an argument against Immortality, I ought not to quit it without also noticing how it bears on that important point: while, of course, the range of my inquiry must not exceed the bounds of natural philosophy. Religion takes its own road, through testimony, to the same mark: any one can hereafter unite the two modes of argument, and value the sum; but I must not here mix arguments which have no logical relation to each other.

Metaphysicians have said, that as the soul is not material, and assuming this, of course, as proved, it cannot be extended, is therefore not divisible, and consequently cannot be destroyed. In such senseless language has this science ever been dealing: and what wonder then if it produces no conviction, though it may succeed in confusing the minds which cannot analyze its proportions; which, very generally, it seems not even to have analyzed itself. It asserts what it does not know, when it says that the soul is not extended; and when concluding that an immaterial entity cannot possess extension, it forgets that life is extended over the whole of an organized body, and can even, in a tree, reproduce new lives from a thousand points on its

superficies ; that it may be actually divisible, for aught that we know to the contrary. But the dealings of this science have been with its own words, not with things ; and ever running round an empty circle, it ends in returning to the point whence it commenced. And when it assumes that there can be no destruction but through discription, this is another of the superfœtations of the mechanical philosophy, though metaphysicians have not perceived it. It is a reasoning from matter and mechanics, respecting that of which we know nothing ; and is therefore of so many purposeless words : commencing with a "petitio principii," and ending in a conclusion which, after all, is but identical. They have forgotten also to see, that if it were of any value, it would equally prove that the Deity had never created a soul. Man would be as eternal as God. But it is not within my bounds to examine all which they have said : every one knows where to find it.

Material or immaterial, He who created can assuredly destroy. This is the sufficient answer, to a bad argument under a well intended purpose. Natural Religion concludes, simply and justly, that He can destroy the soul ; but it also produces some reasons why He will not ; as a Revelation, supported by an immense weight of evidence, assures us that this is the fact. But the materialism in question, rejecting the proof from testimony, not merely concludes that the soul is as temporary as the body, or that it is mortal, but undertakes to prove that it cannot be otherwise. This is the point here to be examined : and the assertion is therefore to be met under its own showing, by inquiring into the solidity of the arguments adduced by the physiological materialist.

I will commence by granting even that which I have

already argued against, to admit the dependence of thought, or mind, as we know it, on organization : when it will still remain to be seen, whether even with that advantage, this materialism is competent to prove the extinction of the soul on the death of the body. If it is not, the system may as well be abandoned ; for it serves no purpose, if it does not serve the only one which it was intended to accomplish. And even this inutility will form an argument against it ; since it is never the usage in philosophy to admit a purposeless hypothesis.

I have shown that Life cannot be the produce of organization, and I may therefore take this as the basis : as, with this I can be content. I have frequently shown that this principle, added to some unknown and inappreciable form and quantity of matter, directs chemistry to the production of an organization, an animal, and that the qualities of these lives differ in such a manner as to produce different organizations, different animals. It is of no moment, for the present purpose, whether the Creator puts the whole of this into the power of the life, or whether He, personally, causes each life to act in a specific manner.

Life, in some way therefore, can produce an animal out of matter, and the machine itself shall even be the thinking being, if the materialist desires it, though the life itself is not matter. The life of a man thus produces a man, through chemistry ; having been attached, in some way, to some portion of matter. And life is not necessarily active, or in action : it can rest or become dormant. It is often dormant in matter of a certain organization, both animal and vegetable ; and I have formerly shown this dormancy to be so extensive, that we know not where it can be limited. In the plant, it is

thus dormant in seeds, and even in the full organization of a moss or a lichen, through centuries. In animals, it is thus dormant in the *Vibrio tritici*, which can be dried, for a longer time than is well ascertained : in the *Gordius*, which has been kept dry for three years, and possibly might much longer ; in the *Vorticella*, which may also be thus dried, till it is blown away like the dust, reviving after many years ; in the *Motifera redi-vivus*, for years also ; in the *Filaria* ; in many of the *Infusoria* ; and, not to accumulate unnecessary instances, in the eggs of some *Monoculi*, producing a living machinery, as a seed does, whenever the requisite circumstances are applied.

Now, if I take the usual metaphysical view, and say, that as life is not material, it cannot be extended, or consist of parts, the result will be this. Every organization, be it ever so minute, must possess extension and parts, and further, include many ultimate atoms of matter. But that which is without parts cannot be attached to many parts, or even to many atoms, for this would be extension : and therefore life cannot be necessarily attached to, and dependent on, an organization, or, still more, compulsorily dependent on this and nothing else. Its attachment must therefore be, not simply to an extremely minute portion of matter, but to an ultimate atom, if it be attached at all, as it must in some manner be in the dormant seed.

This would be the answer, under the usual metaphysical views of the non-extensibility of an immaterial entity ; and there was a time in which it would have been satisfactory and complete. But having shown that life is practically extensible, and hence, that metaphysics have been applying definite language and mechanical reasonings to what is entirely beyond the reach

of our faculties, since this is the truth, I must seek another answer, by inquiring how small a space this immaterial entity can occupy; as an entire whole, capable of practical extension, or as an individuality empowered to produce a perfect machine, which it can also occupy and animate in all its parts.

For the purpose of most readers, a physical fact is preferable to a minute metaphysical or infinitesimal analysis. Life is attached to the egg or young one of that Monas, of which ten thousand do not exceed a grain of sand: or, still, more, it is attached to that germ, which, by analogy, should exist in every egg, and which is therefore still less than this very minute quantity. And it is an entire individual life, with power to produce the full animal, and to become or produce Mind, such as mind, there, is, with all its necessary powers, among which we are sure of some at least, and with that consciousness of individuality which is not different in any other mind or soul.

So small a space may a life occupy: while, under such minuteness, we feel naturally inclined to doubt whether an organization is possible. But, knowing nothing of the possible minuteness of compound matter, any more than of the lowest limits of organization, I may at least ask this question. Why is it that the life must be attached to an organization? We have concluded on this for no reasons, when we attempt to examine them: or, because of an experience which we see to be utterly worthless on such a subject, as soon as we come to investigate it; since, at a certain point, that experience can no longer tell us whether organization is present or not. If it is and must be attached to an organization, then the Deity formed or created the organization before He added the life, constructing

it through the power of His own Life, or Spirit, as the agent to perform that which nothing but life can perform: while materialism will scarcely be able to grant this, since it is to acknowledge a power creating at every minute; the perpetual Providence of God. But if He has deputed so much to the life, deputing to it the very power of producing new organizations for new individuals (if indeed He has deputed anything at all), why may He not have deputed the entire power to the life, from the very commencement, and, attaching it to a particle of compound matter, or to an atom of that which we suppose to be elementary, commanded it to produce its own organization, as it is enabled to produce those for its posterity? No one dares to deny this, because there is no argument to offer against it. Any one may disbelieve it if He pleases, because I cannot prove it: but that is all.

Yet it is possible, or not improbable, or it may be judged probable: while I should be sorry if it were not a far better basis for reasoning on, than any which materialism has assumed, or even than most of those on which metaphysics proceed. But for the present purpose, it is not important though we should refuse to grant that life is attached to ultimate matter, if indeed there be such a thing: it is sufficient that it can be attached to what is extremely minute, while, under such minuteness we do not know what organization is, and cannot even say that two atoms might not form one, if this be held essential for the attachment of life.

Taking this therefore for the basis of the essential inquiry, we can proceed in this manner. Let us suppose that this minute thing, be it what it may, is dried, since I must refer to an established fact, as the Vorticella is, so as to preserve its vitality dormant through an

indefinite time. Let us then suppose, what we also know to be a fact in other cases, that this vitality might sleep for centuries ; and we may then ask, when and why that which had been so long maintained in perfection, and which was perfect but an instant before, is to be suddenly and capriciously destroyed ? There is no answer. Nor is there any reason against this prolonged dormancy, or against a dormancy to any extent that can be assumed. The presence of life is unknown, except as it brings chemistry into action : and, that it may do this, peculiar circumstances must be present. In the cases known to us, these are heat, water, the presence of oxygen, and possibly, of a small quantity of light. There may be others yet unknown to us : such there probably are, even in the common case of the primary action in a germ. And our ignorance as to other and ulterior, existing or possible ones, is no reason for rejecting those : so that we might even suppose, did any one wish it, pre-existent laws for this purpose.

The final conclusion, cleared from all these necessary and preliminary facts is, therefore, and under pure physical investigation, this, namely, that Life may remain dormant, but attached to an elementary atom, or an incalculably small portion of compound matter, for an indefinite time ; ready to act for the production of a living machine, or an organized body performing functions, whenever certain external circumstances are applied.

Now, of the death of an animal body, we know only, that it is resolved into integral matter, which is sometimes of a compound nature ; though ignorant whether it is ever a simple chemical element, as, of ultimate metaphysical matter, we know nothing, and are not even

able to be sure of such an existence. If ever therefore the life was, originally, attached to a very minute portion of such matter, as I have already argued, it may remain attached to any one portion or particle. The machinery has in deed failed, through the cessation of the chemical actions which maintained it ; and the life cannot therefore demonstrate its presence : but it was equally powerless before it began to put that Chemistry into motion, though we are sure that it was then present.

The life therefore may be perdurable, or immortal ; and it may again produce the organization which it produced before : it may do, in the most rigid physical sense, what it once did. Why did it ever do this ? physically, we do not know : we are obliged to say that there was an unknown cause, and thence to yield that it was, ultimately, the will of the Creator. Philosophy cannot say that a cause which acted once, and of which it knows nothing, may not act again : but it is scarcely less than compulsory to refer all to the Will of the Deity, as The cause, where others are unknown ; and thus the conclusion becomes that inference from Natural Theology to which I have thus brought the reader. We must therefore also grant a power capable of doing this ; able to raise, once more, an animal body by means of the same life, identically, which had produced that body before. And as that life did once produce a specific body, by a specific power over chemistry, did produce one pattern of an animal rather than another, and did further, produce one modification of that pattern rather than another variety, it ought to produce, not only that pattern, but that modification preferably to any other one. I say ought, rather than might, because the physical inquiry compels me to this : while it is

plain that this argument leads me, unavoidably, to the restoration of the same body as well as of the individual life. Such therefore might be a resurrection of the dead, even under the common doctrines of physiological materialism. The same organization, moreover, should re-confer the same powers of thought or mind, if it was the organization which effected that before : while the question of consciousness, or personal identity, must remain with metaphysics to argue, as argued it has been, to every purpose that it ever will be.

Thus far I have pursued this question under the very concessions which this materialism demands ; showing, as I trust, its utter inability to prove what it desires, even under its own assumptions, as vaunted for their power as they have groundlessly been produced for facts. And therefore, showing reversely, that the resurrection of a dead body, is, in the first place, not an impossibility, scarcely even an improbability of much weight, and secondly, that it ought not to be considered as a great miracle ; if it is to be the definition of a miracle, that it contradicts or outrages the whole course of nature, or the laws by which the world is governed. It is a fact, on the contrary, supposing it to occur, which would rank under those laws, or other leading facts ; or, it is supported by the general analogy of the creation of animals. That is, it is physically possible, and consistent ; which is the only point here in question : whether it will happen or not, or is a probable event, is not the inquiry in which I am now engaged.

On the far more reasonable supposition, that the mind or soul, is an immaterial entity, as life is, whether it be, in itself, life, or a mode of it, or whatever else of unintelligible, the essential inference is the same. All may sleep, all can rise again, a new body can be pro-

duced under the same soul, that soul can possess the powers which it did before, and ought not to lose its memory, nor therefore its identity and responsibility, because these are itself; whence the immortality of the soul, in the common religious sense, may be a pure philosophical truth: I only say, may be; because this is not proved: but philosophy infers from less, and proceeds on inferences of less value, every day. The Deity may have pre-appointed the immediate causes of all this, if there is yet a philosophy desirous of that: but this would still be His will. Otherwise, He may do it by a special act of that will: but should He even act thus, what more is He doing than He does daily and hourly, in appointing the Creative lives to new atoms of matter? Even under this view, the Resurrection of the dead is no more or otherwise a miracle than the act of Creation; unless indeed every event of the universe which we have not yet witnessed, is to be deemed such. Thus does The Resurrection, though by a special command of the Creator, become approximated to the class of physical inferences, if not of demonstrated physical truths: and even thus, were there no more, it calls on belief: surely, at the very least, on a willingness to believe. It will compel belief in him who shall give even a moderate weight to testimony: for two utterly distinct forms of proof have coincided on one point: while he who believes that Christ rose from the dead to confirm the truth of what He taught will have long before been satisfied from the evidences of Revelation.

CHAPTER LVII.

**GENERAL VIEW OF SOME PRECEDING FACTS, IN PROOF
OF THE CONTINUED ACTION OF THE DEITY IN THE
GOVERNMENT OF THE UNIVERSE.**

IT is always too easy to lose sight of the original ground of an argument amid a multiplicity of facts, and under protracted reasonings ; even when possessed of strong powers of abstraction, and well trained in logical habits. How very soon that is forgotten in other cases, I need not say ; while indeed it is more common to find, that the essence of a question has been entirely overlooked. Abstracting all religious considerations connected with Providence, the pure metaphysical question before us, is this. Did the Deity, at the beginning, establish laws, or rules for action, which were to proceed for ever without His interference, thus withdrawing Himself from all further charge of the universe which He had created ; or does He, on the contrary, conduct those actions Himself, by His personal omnipresence and energy ; while, in as far as they are regular, or appear to be under laws, are not they only such, because of the necessary consistency of perfect wisdom, acting from perfect knowledge ? This is the question : but, here, it regards only the physical government of the universe : it bears indeed essentially on religion, as being the only proof of Providence which can presume to be a demon-

stration ; but the connection is not immediate, since religion appertains to God's moral government.

The first of these suppositions is the philosophy which I have already examined ; the other is the view which I am desirous to prove. But I must premise a remark which is likely to attract more attention here, than where it was slenderly made among some former metaphysical disquisitions. Had the fact been noticed, as it does not seem to have been, modern philosophers, borrowing from the ancients more perhaps than they have always perceived, might not have been so anxious to support the doctrine of original general laws.

I formerly remarked, of the Greek philosophy, that it was little more than a series of wordy disputationes : and if little thought seems to have been applied to it, so does no real interest appear to have been taken in these questions : the Deity being a speculative Being, in whom no one had any personal concern ; a mere object of hypothesis, on which ingenuity might be exerted. Thence the inconsistency, formerly pointed out, under which the same sects, and, apparently the same individuals who maintained the doctrine of original general laws, admitted a resident and universal “ anima ; ” which, with some, was the omnipresent Deity acting on matter, while others, borrowing from the East, considered Him as constituting all the lives and minds of the universe, under a division of His essence. Nor does it ever appear to have struck themselves, that these two things were irreconcilable : although if Seneca's opinion may be admitted to represent that of the Greeks before him, a perpetual and present Providence should have constituted their practical philosophy, while the other was a mere hypothesis for the exercise of disputation. Their views must therefore have been the same which it is

here the object to prove : the apparently chief difference being, that theirs took no definite form, because the conduct and presence of a Deity who was not the moral ruler of man, could have no peculiar interest for them ; above all, where there chanced to be no belief in a future life.

It may therefore weigh with those who have borrowed the Peripatetic philosophy, to know that the Deity of those persons, at least, among the Greeks, was, in reality, the Providence here to be proved : to be demonstrated, I hope, as, by them, He was hypothetically inferred, or imagined, or believed in, under the influence of a borrowed philosophy.

In the last chapter, I have endeavoured to prove that the Deity must have proceeded through a direct and personal government : I might even conclude without impropriety, that He could not have acted in any other manner. In the present one, I have collected from various parts of this work, a number of miscellaneous facts bearing on the same point. They were formerly stated for the sake of other proofs ; and though the present application was sometimes noticed, they could not all have been rendered effectual to this question, under such brevity and so much dispersion. As they are now condensed, they form a combination of at least high probabilities : while the sum of those ought to constitute the proof ; since the argument, in this case, belongs to the class of moral reasoning..

The order (“the laws”) of the animal actions has been fixed to meet the ordinary wants, or, so as to conduct itself rightly under unvarying circumstances : we can conceive it to have been arranged at any remote period, if that is desired, or might even imagine ourselves to know what those “laws” are. But the cir-

cumstances vary, and a new order of proceeding takes place. If there are dormant laws, to be only called into action under events which may never happen, the philosophy in question must at least modify its doctrine of general laws, very materially ; as it must then admit a species of foresight in the Deity which it might not be desirous to grant. A self-acting provision against a merely possible event, which is also efficacious under many variations of the circumstances, and in many different degrees and modes, is not very intelligible : the appeal to the constructor of the machine seems at least more simple, and, to ordinary reasoning, more natural. But I must inquire into the explanations, since the attempt has been made ; as it seems to satisfy those who have offered those solutions, and those who are contented with words.

The reparation of injury, and the substitution of actions and of parts, are of this nature. But I need not state the facts of surgery to general readers ; since there are many others which every one can understand. The deformities of animals, as I formerly remarked, are not reconcilable to general laws, because it is of their very essence not to vary : while, in this case, there is no corrective provision, to prevent or remedy the occurrence. It is familiar, that the clothing of animals transferred from a warm climate to a cold one, becomes increased. If this is a result of the action of cold upon the organization, physiology must explain how it causes the new bulbs for the new hair to be produced, or how the sedative power of cold becomes a stimulus increasing action. Words will not suffice in philosophy, whatever power they may have in medicine and physiology. If it is an "appetency" on the part of the animal, that desire might produce horns, or aught else of the analogous growths ; since magnitude or minuteness are equal,

where a new provision of vessels must be made. It is the same as it regards the changes of animal clothing between the winter and the summer. The hair bulbs are presumed to be permanent organs; because, when destroyed, they are not renewed: but in this case, a portion only are productive at one period, while the whole are fertile at the other. This is not a law of periods; because the increased growth does not take place, if the animal be removed to a warmer position: while the magical word stimulus explains just what it did before. The changes of colour between the summer and the winter offer more than the same difficulty: it must be explained, not why the stimulus of cold causes the colour to be absorbed, leaving the hair white, (since this is at least the frequent fact,) but how it is, that the colour begins to disappear before the cold has arrived. Whether the soothing influence of words has prevented the facts from being analysed in all these cases, others must determine: it is plain that they have not been examined.

The parts of animals are strengthened by use: the purpose at least is obvious. It has thus also been rendered evident, in the first place, that additional strength was required; while some law, or some agent, has become acquainted with this new demand. The stimulus of exercise is the usual answer; as before: and this is, under a presumed law, the increase of action through the irritation of vessels. We can conceive this to act upon a muscle, at least in that vague manner which satisfies physiology; but how does it cause additional earth to be deposited in the bone, or more firmness to accrue to the cartilaginous basis, when the minute parts of this structure are incapable of being affected by such motions? In the leg of a horse, there is not even a muscle to press on the bone, so as to

stimulate the ultimate vessels which execute this new duty ; as the force of impulse also does not act on the bone itself, but on the several springs which support the weight. The tendons and ligaments endure all : they also are strengthened : but the solution which has so often failed, can scarcely be the true one, even here.

The acuteness of the senses is increased by use : there is an increased demand for power, as in the first case, and it is supplied. He who explains it by the words practice and habit, is again, among those who are easily satisfied. The accurately proportioned supply to the unequal wear of parts, is equally explained by the word stimulus : as is the increase of peculiar secretions where there is an unusual demand for them : in this last case at least, a cause acting through the imagination is no otherwise a stimulus than as a spur is to the rapidity of a horse. It may also be asked, what is the stimulus under which horn or hair grows because it is cut. A resemblance between the words cause and because, seems often to have possessed greater influence than has been imagined, in other cases than this. The horse's hoof might be stimulated by a hard road, but not by the farrier's knife. This is more than sufficient. If there are laws, physiology knows perfectly well how they ought to be demonstrated : and, not doing this, it cannot claim assent to its phraseology, as a substitute for understanding. Till this be done, the question between that science and another philosophy is at least in suspense.

The same train of reasoning applies to plants : where the facts also are even more striking. Their growth, whether in form, or in the production of their annual parts or organs, follows no rule : we cannot understand the meaning of "laws," under such an entire unsteadiness of conduct ; resembling caprice, rather than aught

else. The organic proceedings of animals are absolutely regular in comparison. But plants too repair their own injuries, or find substitutions: as they are also strengthened by external violence. The determination of the annuals to leave a progeny behind, seems to belong to an internal will: no conceivable application of a stimulus can be the cause in this case, whatever might be supposed in the last. But even the inventions of the physiologists fail in attempting to explain their changes under cultivation. These are perpetual breaches of all imaginable laws; counteractions of laws. I know not how the most fertile imagination could contrive a set of laws to perform even the least of all this. But in the whole of these irregular and contingent events, there is one thing which we can see: a purpose belonging to the moral government of the Deity. And though the means by which He effects that purpose should hereafter be shown, it will not be proved that He does not superintend and direct the conduct of those agents.

I may term the preceding cases negative ones, under the present argument: they do not prove the desired point, but the usual philosophy cannot account for them, in any manner, on its own grounds. They may be considered as proofs by dilemma: the following offer arguments of a direct nature.

The Locusts migrate in search of food. But they cease from this pursuit though that food is not exhausted, and fly off to the sea, where they perish. This appears to be conduct against motives. Nor are they necessarily blown off by the winds in those cases: they often fly against the gale. This is doubly unreasonable; for there is exertion against opposing force. What power effects this, if it is not that of God, commanding?

It is not a law, a portion of a previously established order: since their proceedings are uncertain, irregular, apparently capricious. He ordered them to destroy, as He produced them in destructive multitudes; for some purpose of His own. He has watched their conduct, as He directed it; and He sees that they have executed what He intended. If this is not His personal government, how else will it be explained? His revealed Word has informed us, more than once, that He thus governs the insect races, using them as agents between Himself and man: and do not the facts and the revelation mutually confirm each other?

Of the great actions in the universe which have already been noted as bearing on this question, one of the most conspicuous is the gravitation of the celestial bodies; respecting which, I have already stated in the introductory chapter to this division, as an example of the mode of proof here adopted, what the present remarks will complete. Assuming the common doctrine of the inertia of matter, it is conceivable that all the linear motions of those orbs implied only that temporary act of power from which the Creator might have rested, without further concerning Himself with that which He had once established. But no theory, of this truly Peripatetic nature, has ever explained the continued act of gravitation. It is not the continuity of a motion once impressed from without, but it is a perpetual effort to overcome a resisting force, whatever else it may be: and it acts for motion in overcoming that resistance. This is, as if a principle of motion, or effort, or will, were inherent in matter: but to admit this, is to confound the very definitions of matter and spirit; of that which is acted on, and of that which acts. And, substitute whatever intermediate agent we

may, as such have been proposed, this but removes the difficulty one stage, as usual, since there must still be a power beyond that: as, after any number of removes, there must ever be an initial one. The power therefore which ultimately produces the gravitations of all the bodies of the universe, can be no other than that Power which created them: and as it is one which acts at every instant, all over the universe, the interposition, or personal government of the Deity must be perpetual, as it is ubiquarian. *ubiquitarian?*

Corpuscular, or cohesive attraction, be it different, or analogous, or a modification of the same power, admits of the same reasoning: it is a tendency to move, and it is motion: it must be distinct from mere matter, it exists everywhere, in every particle of matter, and it is ever acting. The Spirit therefore which is its source must ever act, in every point of the universe; and the ever-governing Spirit is the Providence of God in the world.

What causes Light to move athwart the whole universe with a velocity that confounds our imagination? eternally traversing those illimitable regions where myriads of orbs are incessantly circulating under the same guiding power: traversing for ever and ever the abyss of vacancy, no, not of vacancy, but that incomprehensible vast, where floods of light, millions of lights, are ever executing the Deity's commands, ever in motion, and ever performing myriads on myriads of the most incomprehensible motions. Light does not move itself: who moves it, if He does not? and when and where then are not His interposition, His government, His Providence?

Is Heat matter, or is it the motion of matter? Philosophy doubts, and differs with itself: but it is of no

moment, to the present question, on what it may decide. It is a living and an acting spirit throughout the wide universe : it pervades all matter and all vacancy, all space : it is ever in motion ; and if we have not indeed observed very falsely, it communicates motion to every mode and form of matter. Gravitation is neither more extensive nor more active : its actions may be more conspicuous, but those of heat exceed them in variety and multiplicity, beyond the power of numbers to imagine. It is an ever-acting and universally-pervading life : and is it not His Life, does not His hand command it, move it, keep it in incessant motion, and keep it in motion everywhere, throughout the vast universe ? If it does not, then has He made life and motion independent of Himself, appointed a spirit and a power which He does not command ; or else there is a living Spirit which does not derive from Him, the source of all motion and life. If heat is independent of Him, He has given it more than power : He has almost given it intelligence, consciousness, will, with creative energy and design : He has done what no one can admit, no one believe. Is there one who can even conceive that this power is self-moving, self-intending ? if there be not, then are His energy and His will for ever acting ; for ever designing, and for ever executing, everywhere throughout the Universe. And this, again, is His Government, His Providence.

The power of Chemistry ? that great and universally pervading spirit of the wide incomprehensible of Creation, that soul of every, the minutest atom, wherever existing, from orb to orb, throughout all space, that power of an internal life to each and every sphere of the immeasurable universe, the great agent of living and sentient beings, the agent for their production, embrac-

ing every action within each planetary globe, with every action constructing and maintaining every being that occupies its surface, is it a compound of attractions and repulsions, of heat and of some mode of gravitation, or is it more? These doubts do not concern us here. It is the creative power of the Deity > that living and moving agent by which He changes the forms of matter, from hour to hour and minute to minute: and it is also His destroying power: ever destroying and ever renovating, and destroying but to renovate. Under Life, under those controlling and designing powers, designing under Him, and which He is ever creating and imparting, it is the workman; busied at every instant of time, in millions upon millions of independent circles of actions and existences, throughout the earth: and, beyond our nothingness of place and being in the great universe, busied at every instant, on numbers, before which it is idle to say that imagination fails, when it fails even before what is ever going on in this atom of our most insignificant globe.

Whose action, whose motion, whose power is this? Was it exerted by Him, once, and at that once, for ever? Was it commanded at the beginning, and after having been commanded, was it neglected? we must not say, forgotten. He who believes this, under moral views, may believe anything. He who believes it under physical ones, must explain the grounds of his belief; for no one can explain them for him. It is a strange philosophy which shuns or refuses an easy solution, to adopt a difficult or an impossible one: a solution, which were it the custom to consider Him who created all things as a cause, in philosophy, would disgrace the most minute and shallow of philosophers.

Whence is all this? Is there not a cause ever at

hand, competent to every thing, every effect, every solution of every difficulty? and if there be this cause ready when all others fail us, is it the one especially to be rejected, to be the only despised, the cause to which we must be ashamed to appeal, because it is the cause of all causes, the undeniable, the First cause? But the cause is God: and we do not choose that He who thought fit to create an universe, should also think fit to govern it: that He who could condescend to create an emmet, and provide for it the means of enjoyment and happiness, through the most incomprehensible train of contrivances, providing this also for emmet on emmet, through hundreds of thousands of generations and myriads of individuals, should also continue to execute, at any future minute or day or year, to all time, what He did condescend to execute at some previous moment.

Condescend! all is condescension in the views of the proud, unfeeling, man, who thinks and labours for nothing but Self; himself. Fortunate is it for man that his Creator does thus condescend: and did he feel as he ought, but to his own species, did he feel what that Creator has commanded him to feel, by that law eternally written in his heart, though it had never been given him in words, he would never have doubted or denied the Government of God, never have rejected the only solution of all his self-invented difficulties, never have believed or maintained that no Providence governed the world, no all-governing Mind took charge of its own universe: yes, equally of him, the ungrateful, not less under the incessant care of that ever watchful Power, who, if He were what man is, would cast him off for ever, to seek, in other power, and other protection, that care which he has ceased to deserve.

Independently of what I have stated in the last

chapter, on the imparting of vegetable and animal lives, I have formerly shown, that no power of mechanics or chemistry could have fashioned an animal or a vegetable machine, could, especially, have fabricated the hundreds of thousands of distinct machines which constitute the sum of vegetable and animal forms and existences. I then called this power which controlled and directed the blind and undesigning power of Chemistry, directing it as an architect directs the workman under him, a Third power; and it is one which must have been either deputed by the Creator, or retained in His own hands, and exerted by Himself. The deputation of such a power as this, we cannot comprehend, or even conceive, under any stretch of imagination; far less under the idly adopted hypothesis of a law, appointed, no one can explain how, nor for what purpose, if it is not that to which I have so often alluded: while few know, that in adopting a term to which there really is no definite idea attached, they are unwarily following in the train of a philosophy which was not always content with excluding the Deity from His own government, but thought fit to suppose a "Nature" performing every thing, under a system of laws: never checked by the very obvious doubts, whether such laws could have existed without a lawgiver, or have acted without an executing agent, or whether "Nature" was not but another term for its Author.

In repeating then, that if nothing but He in whose hands life is, could give lives to successive germs, so I may add, that there can be none but He who could direct those lives to perform the works which they do; to build up those beautiful machines which constitute animals and vegetables, to build them up with such pre-

cision and constancy, and, where they are animal, with such perfect adaptations to the inclinations and desires of the sentient principle in each. The execution lies, or appears to lie, with the life directing the chemistry, but that produces hundreds of thousands of distinct and constant machines, and these machines also discover the most ample and decided indications of some very high intelligence regulating their production. We are not more sure that this constructing intelligence is unconscious of its knowledge and its powers in the plant, than we are sure of it in the animal : knowing it, without a chance of error, in and of ourselves.

And there are but two solutions ; while under either, the conclusion is the same. Be it, that the intelligences are imparted to the lives, while, in them therefore, it is an intelligence without consciousness, who but He could have imparted millions of such intelligences, imparting millions on millions for ever ? And each, of hundreds of thousands, possessing a limited scope of knowledge, a specific set of intentions : each a will, with a power, yet that will also limited, willing but one exact set of actions, or one pattern and one architecture. What could even have bounded those actions but a superior Will ? And let it be a "law," let there be laws of any number, under which imparted lives shall produce definite architectures, it must still be true, that He gives the law of intelligence and will, for a certain end, to each new imparted life ; since He could not have given them before the existence of those lives : while if all this is given to millions of lives in each second of time, there is not one of those seconds in which His Providence is not ever active, ever superintending, throughout the whole extent of the boundless universe.

If we adopt the other solution, the conclusion will appear even stronger : though stronger, in reality, it is not, as to this question. The Deity has not deputed this intelligence and this will ; but He is, Himself, the intelligence and the will. He, God, must therefore be present, as He is alone to be conceived present, once at least, in every life ; directing it by His own intelligence, or else directing that chemical power which is the constructor, but the undesigning and unintelligent one ; constructing simply, and working to the several ends to which it is directed, as the blind and obedient workman obeys the Architect. And if it be thus, He is present, in His intelligence and His will, with every new animal life, as with that of every plant also. But He cannot be present with that which is not yet in existence : He must become present as soon as it begins to exist, at least, though we should desire to think that He might absent Himself afterwards, and leave the life to its own ordained operations. And if He even should only thus become present, at first, and but once, that He may exert His intelligence and His will, where neither intelligence nor will, under any mode that can be imagined, can yet exist, then is there not an instant of time, not in this earth only, but in every sphere that bears a life, in which He is not acting, and acting everywhere : the ever designing, ever thinking, ever working, and therefore ever interfering, interposing, governing, power of the universe : the Intelligence, the Spirit, the Life, the Soul, the universal Soul of all.

And what then is His Providence, if it is not this ? Does our incredulity arise from our narrow, and vainer than narrow views ; is it that His government is not like ours, that He does not govern the world as we

would govern it for him ? His conceptions of a good government, of the best mode of governing, and to the best results, do not resemble our own ; and therefore, being admitted to be Wise, yet not conforming Himself to our opinions of our own wisdom, it must needs follow that He does not govern. The syllogism is defective in a most important point : yet it is one of the very syllogisms of this philosophy, and it has not been perceived. His system is too orderly, too regular ; and therefore it is no system of government. But the conclusion is just enough : man is not the bad logician that I have insinuated. The evil of his spirit cannot rest under order : it cannot be contented with the peace which it possesses or the happiness which it enjoys : it cannot conceive a government without change, irregularity, uncertainty, caprice, without the perpetual attempts of ignorant wisdom after some unattainable thing which it cannot even define, and therefore without the constant demonstrations of interpositions, known only by their want of wisdom, and the consequent evils which they produce. But the government of God is not the government of man : and therefore,—is it so indeed ?—it is not a government.

If I may here refer also to the subject of the Coral islands as described in the 22nd Chapter, for another proof to the same general effect, it is too striking and demonstrated a case to be passed over without a brief restatement, in as far as it bears on an ever superintending and acting Providence. The Coral polypi, united by a common animal bond, construct a defined form in stone : many kinds construct many forms. An allotted instinct may permit each polypus to construct its own cell, but there is no superintending one to

direct the pattern, nor can the workers unite by consultation, for such an end. There is no recipient for an instinct by which the pattern might be constructed. It is God alone therefore who is the Architect ; and for this end consequently, He must dispose of every new polypus required to continue the pattern, in a new and peculiar position which the animal could not have discovered by itself. Yet more : Millions of these blind workers unite their works to form an island, which is also wrought out according to a constant general pattern, and of a very peculiar nature, though the separate coral works are numerously diverse. Still less then, here, is an instinct possible. The Great Architect himself must execute what He planned, in each case equally : He uses these little and senseless animals as hands : but they are hands which Himself must direct. He must direct each one, everywhere : and therefore He is ever acting.

After this, it is perhaps but supererogation, to call to the reader's mind, for the same purpose, what I formerly said of the limited and specific intelligences, or instincts of animals : yet I ought not to omit adding it in this place, where it is likely to make a greater impression, thus concentrated, with other analogous facts, on the leading object, than as it formerly stood, alone. To take the knowledge of the Bee only, as a sufficient instance for this purpose, all agree, by whatever term they choose to call it, that it is imparted knowledge ; as mathematicians know that it was imparted by a perfect Mathematician. It could not have been given, until, at least, the life which was to construct this machine, the Bee, was imparted, or created, or appointed. He, then, who gave a portion of His knowledge to a

new entity, whether He created that entity by His own act or hand, or did this under general laws independent of Himself, must at that moment have been present, as the Deity is present, at that place and point: and, at such a point He must have acted, or willed, at that specific instant when any one of those lives was endowed with knowledge, as at every instant throughout the world, wherever such lives were produced; as also, He must continue to act, now, everywhere and at every instant, wherever they are produced.

This, again, is His perpetual government and Providence. Can there be any evasion of this inference, by adopting the misty and magical term, a law? giving us a word in place of an idea, and serving to obscure, or satisfy, only the slender judgments which cannot think definitely and closely. It is a term that will pass with sufficient ease, as an explanation of much of the management of the world under its Creator: and, under the usual laxity of thinking, it has often passed, where a very slight analysis might have sufficed to detect its weakness. But in the present case, it is much more than simply unmeaning: while I need not give it the appellation which it merits. In the usual sense of this term, as a philosophical cause, in the only sense, in fact, under which it would serve the purposes of that philosophy which assumes that the Creator does not govern by His personal interference, its meaning is, that He had, from the beginning, established or deputed a power, or a species of machinery, for executing, through all time, what He originally willed, without His interference or care, or even, as this principle has been sometimes excluded, without His knowledge. In the present case therefore, the conclusion would be, that

an Intelligent Being had statuated that portions of His own intelligence, not of some general intelligence simply, but of definite and peculiar knowledge, should go forth, at every instant of time for ever, to thousands of millions of beings, of His own appointment, without any act of His own will, and even, under one of these hypotheses, without His knowledge, or consciousness. If there is any system of metaphysics which can explain the nature of such an intelligence as this, even putting aside the whole question of the purposes and character of the Deity, he who is satisfied with the explanation must possess a highly paramount degree of that peculiar quality of mind to which the hypothesis of utter non-entity has proved satisfactory. And if this, above all, is the nature of the Supreme intelligence, then indeed is it true that it is an incomprehensible one : though in a far other sense of that term than is generally understood.

But it is time to terminate these physical evidences of the personal interference and government of the Deity. If anything has been proved, from Creation, of any one of His attributes, the proof of His Government is surely not less perfect, or ought not, at least, to be less satisfactory, since it is of the same quality as all the rest ; being of the only nature which physics furnish, and therefore of the only nature we shall ever attain through the study of the visible universe. I may then safely conclude, that God does exert a perpetual government, over the physical world at least; that it cannot proceed without His immediate action, or personal interference, and that no appointment of deputed "laws," of modes of motion originally impressed on matter, will account for the phenomena of the universe, and, very

especially, for those which appertain to life. I have said, modes of motion impressed on matter ; because this is the general expression for whatever philosophy has called the laws of nature. And it is not here the question, whether He may, or may not, have deputed whatever does require the interference of intelligence, to Intelligences beneath Himself. This is a purely speculative inquiry, whether we view it as a question of theology or metaphysics : and, as such, there being no facts, there is no reason why I should give it a place here.

But the great question which concerns us, man, is, whether He also governs the moral world as He does the physical ; and I ought now therefore to ask, whether any direct evidence of this can be derived from those facts in Creation which constitute the proofs under the present plan. I have formerly offered a species of indirect argument to this purpose, and will here re-state it briefly, in the form of the “ *reductio in absurdum*. ” The whole universe was appointed for the sake of animal life, and that universe, including the production of animal machineries and animal lives, is governed by His constant interference. It would therefore be the inference which I have thus called it, if He who governed in what is merely subsidiary, or preparatory to another and an ultimate purpose, the happiness of sentient and intelligent beings, which is the moral world, did not also govern in this. And more especially would it be an “ *absurd* ” conclusion in the case of man, when the moral portion of the whole appointment for him presents an importance so far beyond what it possesses in other animals, and even so far beyond that physical portion under which it exists.

But it seems to me that this conclusion can also be

inferred in a more direct manner. I have shown that the Creator imparts specific kinds of knowledge to animals: and this is a moral interference and government. I must now add, as I reserved it for this place, that He imparts affections, feelings, propensities, desires; these constituting the instincts of animals, in as far as those do not consist in specific knowledge. And this too is a moral government, in even a more generally received, and accurate sense of that term; since He is hourly interposing to create, appoint, or implant those, and also to regulate them to their ends; or, is as perpetually employed in producing and directing the moral machinery of the animal world, as in creating and managing the mechanical structures to which it is attached. I need not extend this to the case of man, though it is the most important one: since the conclusion, though wider, is still of the same nature.

Again, in the case of the inferior animals, it is a moral government to have limited their wills; to have communicated certain desires, and excluded others: thus preserving a moral order in this portion of the world, on which I had occasion to speak formerly. I do not say that this was not arranged when the animal was formed: but it is not the less a moral government, and by interference, since it must be perpetually done for every animal. It is further true, that moral actions are excited by physical occurrences, as they are also directed by the influence of those. But if the Deity governs the physical world, governing therefore its events, so must He, of necessity, govern the moral one. Such government may indeed be indirect, if it is a consolation to any philosopher to think that He does not, immediately and simply, operate on mind: but it is not

the less a moral government, with Him who may choose whatever modes of working He pleases, and whose wisdom of choice, at least, will not be disputed.

I need not recall to the reader's mind, the numerous other minor and insulated facts and remarks as to a governing Providence, which have occurred on various occasions throughout this work. What I have here stated and recapitulated, forms a sufficient portion of that mass of evidence respecting a moral government on the part of the Deity, which is derivable from physical facts and considerations ; and the great purpose ought to be attained, if that can ever be the result of such evidence. Beyond this, the inquiry passes into the region of metaphysics ; and thus has it occupied the preliminary chapter to this division of the present work.

I may therefore conclude. Let him who, as a mere philosopher, has doubted of the Providence of God, investigate his grounds for this doubt, and see whether it does not rest on a pure assumption as to the nature of the Deity. And if that assumption is not of his own making, let him inquire if he has not as blindly received it, as he has, through neglect, indolence, or habit, entertained it ; borrowing it from an age of ignorance in sound philosophy, and of equal ignorance and presumption in theology : an age which, as a philosopher, he knows that he ought to despise, on almost all other questions of philosophy. Should he find his foundation to be thus baseless, as most truly it is, his whole structure falls, on the first touch, and he is free to philosophize on better grounds. To him who doubts, under a general doubt respecting a Supreme Being, there is here no new answer. If there is any one who prefers an ungoverned world to the care of an all-wise and good Governor, it is

a question of choice, and I know not who but himself can influence that choice. If his will be perverse, the regulation of that will is with himself: if he cares not, he cares for nothing; and who shall teach him to care? If he asserts what he does not believe, he is evil; and when he labours to determine the belief of others, mischievous. To him, to such, I have nothing to say. They must seek elsewhere: and all have been told where they shall find, if they will seek. Suffice it if I have done aught to regulate or fix the opinions of the unbiassed and willing inquirer after Truth: my task is ended.



THE END.

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